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POPULAR SCIENCE

September 35¢ MONTHLY

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PAGE 99

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SEPTEMBER, 1955

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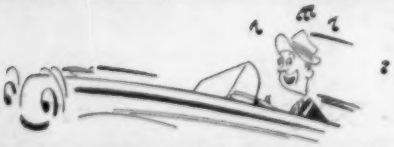

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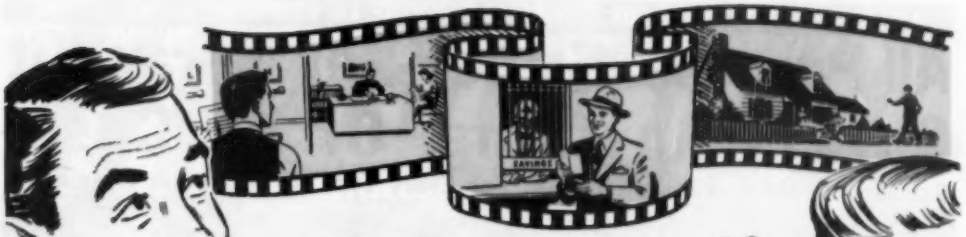

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In the future, for each selection I decide to keep—I will pay special member's price of only $1.65, plus few cents shipping charges . . . *a saving of 40% off the usual retail price!* **LIMIT: Only one sample package per customer.**

Name . . . . . .

Address . . . . . .

City . . . . . Zone . . . State 7-9

IN CANADA *Address:* 105 Bond St., Toronto 2, Ont.

NOW! A 49½c that protects your

New Trans-Kleer Storm Window Goes on In 5 Minutes Without Tools, Hooks, Screws or Nails

NOW . . . Storm Windows need not cost you up to $14.00 apiece. American industry has developed a lightweight flexible product that enables you to seal out wintry blasts for only 49½c a window! Imagine it! For pennies per window you can insulate EVERY ROOM in your home! This new material was developed by the Gary plant of a billion-dollar American aluminum firm—for use by the U.S. Government during the last world war. It looks like glass, yet can't peel off, never chips, shatters or rattles. Actually flexible like rubber. Has a tensile strength of over one ton per square inch. Crystal clear, not milky or yellowish like some plastic materials. Weighs less than 1/10th of the lightest glass windows ever developed. Even a large window comes to less than 8 oz.! Not affected by snow, sleet, rain or dampness—because it's 100% waterproof. Won't crack even at 53 degrees BELOW FREEZING! Use and re-use it YEAR AFTER YEAR for winter comfort and protection.

Sensational Discovery Used By Army To Fight Cold

One of the big problems of World War II was how to defend our troops and protect equipment against the ravages of Arctic winters. One of the world's greatest aluminum companies was ordered to build a special plant at Gary and soon millions of yards of a new material was moving out to Alaska, the Aleutians, Iceland and Greenland. It was not available to the public because every inch went to protect our men, vehicles, planes and weapons. Finally, it was released to the public and ever since the demand has been greater than the supply!

Install Trans-Kleer Windows in 5 Minutes!

Trans-Kleer storm windows require no nails, hooks, screws or tools. No back-breaking toil or broken glass to contend with. Cut off required amount trim to fit the inside of your window large or small, square, round, rectangular—it makes no difference! Then press on the special Adheso border supplied and your storm window is firmly in place. Simple, easy—a child can install them! And Trans-Kleer windows, because of the LOW CONDUCTIVITY development of Reynolds engineers, give you real winter protection, actually keeps wintry blasts out of your home.

LIFT ADHESO BORDER FOR AIRING

To ventilate the room, just lift from the bottom after first loosening the Adheso border. Then reseal—you'll find it seals as tightly as when first applied to the frame. It is TOP QUALITY adhesive material and retains its effectiveness over long periods of time.

Use Year After Year—No Upkeep Cost!

At winter's end just fold away your Trans-Kleer like cloth for use next year. You can air the room at any time, too—lift the Adheso border to let in fresh air, then press back and it's sealed tight again! Clean easily with a damp rag. It's no wonder so many home owners, hospitals, churches and public buildings use them! TRANS-KLEER comes in kits 36 inches by 432 inches and costs you only $4.95 complete with Adheso border! That is enough for 10 windows—each measuring 10.8 sq. ft.—just 49½c each! In all you receive 108 SQUARE FEET for only $4.95! Good GLASS storm windows cost from $7.95 to $16.00—for ten you'd have to pay $79.00 to $160.00. With Trans-Kleer you not only have a terrific amount in the purchase price you also cut down enormously on your fuel bills!

LOW COST HEALTH PROTECTION

The new Trans-Kleer storm window is wonderfully transparent—you can hardly see it. Yet it shuts out winter's chill blasts and saves dollars in your fuel bills. Yet the window illustrated here costs only 49½ cents!

Over 2 Million Windows Sold Last Year

For years, demand for Trans-Kleer has outstripped the supply. Lucky buyers of the first windows told their neighbors and the word spread. Last year alone, over 2,000,000 were sold, yet thousands of folks were disappointed when the supply ran out. Advertising had to be curtailed and our huge supply was exhausted earlier than anticipated. There will be another wild scramble for them this year. Production has been planned for 2,500,000 this year—but even this huge total might not be enough unless you act FAST!

Test In Your Home AT OUR RISK!

Here's your chance to get Trans-Kleer on a HOME TRIAL BASIS. You can't lose a single penny. Mail the coupon below and a 36 by 432-inch kit—108 SQUARE FEET—will be shipped to you immediately, complete with Adheso border. Deposit only $4.95 plus postage with the mailman. Try TWO windows in any room. Test them—see for yourself how they seal out drafts. Compare the temperature—any 25c thermometer will do—compare with any other room in your home. See the difference—feel the difference.

STORM WINDOW family all winter!

10.8 Sq. Ft. Window Costs only 49½c—Used by U. S. Army in Iceland and Alaska—Now Available to Public

Then if you're not convinced they're every bit as effective as ANY storm window—why, just keep the TWO windows and return the balance and get your $4.95 back at once!

STRETCHES WITHOUT BREAKING!

THIS SUPERB NEW STORM WINDOW STRETCHES WITHOUT BREAKING! Has tensile strength of over 1 ton per square inch. You can push it with your foot and it stretches—then springs back undamaged. Developed for the Armed Forces during World War II by one of the world's greatest aluminum factories. Installs quickly and easily inside regular windows of any size or shape. Millions now in use throughout the U.S. and Canada.

Good storm windows, whether of glass, thermopane, plastic or Trans-Kleer can save you many dollars on fuel bills—if they are well sealed. Follow these 5 rules carefully: **1.** Check for leaks. **2.** Make sure window fits tight. **3.** Caulk aluminum type before installing. **4.** Store wooden frame type in dry place to prevent warping. **5.** Replace all cracked panes at once.

With the development of Trans-Kleer you have no storage or caulking problems, no shattering glass, no panes to replace, no leaks to seal, no hard toil to install or remove! They go on the **INSIDE** of the regular windows.

The Adheso border on your Trans-Kleer seals your home in—all winter long! You have no **LEAKAGE** worries. You get greater warmth—greater health protection. And for only pennies!

Trans-Kleer permits you to air your rooms simply, easily. You merely lift the border to let stale air out, fresh air in. Then press back in one second and you have perfect insulation again. This can't be done with certain other type plastic windows.

Freezing weather is on its way. Play safe! Get your Trans-Kleer now! Orders received too late will be returned at once. Rush coupon now and avoid disappointment!

Avoid Disappointment—Order Now!

Millions of folks in the U. S. and Canada are reading this same ad in hundreds of magazines and newspapers. Don't wait until it's too late! Play safe! Rush the coupon NOW! If you wish to save postage cost, send check, cash or m. o. for $4.95 and the windows will be shipped postage free. Order direct from:

MAKE THIS TEST!

On a windy day, hold a lit match inside a closed window . . . the first gust of wind will blow it out. Now put up your Trans-Kleer window . . . a lit match will NOT blow out EVEN IF YOU KEEP YOUR REGULAR WINDOW OPEN!

THORESEN'S

352 Fourth Ave., Dept. 7-K-47, New York 10, N.Y.

RUSH FOR FREE HOME TRIAL!

THORESEN'S, Dept. 7-K-47
352 Fourth Avenue, New York 10, N.Y.

RUSH the following kits TRANS-KLEER measuring 108 **SQUARE FEET** each (enough for 10 windows averaging 10.8 square feet each). Include improved **ADHESO** Sealing Border and easy picture instructions. This order is on a Home Trial—money back guarantee basis. I must be satisfied in every way. I shall use enough material for 2 **WINDOWS** in any room of my house—without obligation. They must seal out drafts. I must **SEE** the difference on my thermometer. I must **FEEL** the difference. Then, if I am not convinced that they are every bit as effective as any costly storm window in the market—if I am not satisfied for any reason, I shall **KEEP** the 2 windows **FREE** returning the remainder in the next week for quick refund of the **FULL PRICE**—no questions asked!

CHECK AMOUNT DESIRED BELOW
—Note Special Quantity Savings—

☐ **1 KIT (108 Sq. Ft.) for 10 windows—$4.95**
☐ **3 KITS (324 Sq. Ft.) for 30 windows—$11.95**
( ) **Payment enclosed. RUSH postage FREE.**
☐ **2 KITS (216 Sq. Ft.) for 20 windows—$8.95**
☐ **6 KITS (648 Sq. Ft.) for 60 windows—$20.95**
( ) **Send COD plus postage.**

Name.....

Address.....

Town..... State.....

CANADIANS: Save tariff by ordering direct from THORESEN'S LTD., 45 St. James St., West, Dept. US-47, Montreal 1, Que. Same prices. Same money back guarantee. Immediate delivery from Montreal.

This amazing invention can make your engine last longer without an overhaul, save you up to $250 in repairs; You never change it. This "miniature oil refinery" is

Guaranteed 100,000 Miles!

Abrasives can't get through porous bronze (greatly magnified). Because of the cone-shaped element (only the original, genuine Life-time filter has this design), particles fall to bottom of case. Only filtered oil can return to circulation in your engine.

Every mile you drive, tiny diamond-hard particles of carbon and other abrasives work their way into your oil, get between bearing and cylinder surfaces, wear out your engine.

HOW TO STOP THE DAMAGE

Now, after millions of miles of road testing in government, truck and taxi fleets as well as in hundreds of thousands of private cars, engineers announce:

"results are conclusive. Filtering oil through the Life-Time porous bronze element definitely removes 'danger zone' abrasives, prolongs engine life, reduces overhaul and repair costs."

FACTS ABOUT LIFE-TIME FILTERS

Used in supersonic aircraft as well as in cars, the *Life*-Time filter is made of millions of tiny bronze balls fused into a screen so fine it takes out *all* abrasives in the 10-to-40 micron (390-to-1500-millionths of an inch) 'danger zone' that cause major engine damage.

In addition, this "wonder metal" used during World War II and now adapted for the *Life*-Time filter actually removes acid-producing water from oil! Yet it doesn't soak up any of the valuable additives you're paying for in modern oil.

You never change a *Life*-Time filter; just rinse it out and use it over and over again. This saves you the cost of throwaway pack replacements, besides what you save on engine repairs, save on oil consumption and gain in the resale value of your car.

TRY THIS AMAZING FILTER AT OUR RISK!

Send us the make and model of your car and we'll send you a *Life*-Time filter to try in your car. If you aren't convinced within 10 days that it will *save you twenty times its cost*, we'll refund your money without question and let you keep, without any cost, the Magnalizer acid neutralizer described below. Ordering is simple:

1. If your car already has an oil filter, send for a *Life*-Time Conversion Kit which replaces your present throwaway pack with *Life*-Time porous bronze. Price: $6.95 for all cars except Buicks with hydraulic lifters and cars with full flow systems, which are $13.95 (please send make and number of present filter, if you know it). We pay postage.
2. If your car has no oil filter, send $12.95 for complete unit, including case and element. We pay postage.
3. Or send only $2 deposit, pay C.O.D. charges on arrival.

Continental Manufacturing Corporation, Dept. FPS-9
Washington Blvd. at Motor Ave., Culver City, Calif.

FREE! ACID NEUTRALIZER $2.95 value

Made of magnesium—the "sacrifice metal" that acid attacks instead of steel—the Magnalizer acid neutralizer is yours to keep free, without obligation, whether or not you decide to keep your *Life*-Time oil filter after your 10-day free trial!

Continental Manufacturing Corporation, Dept. FPS-9
Washington Blvd. at Motor Avenue, Culver City, Calif.

Name_____

Make, model, year car _____

Present filter make (if known) _____

Address_____

City_____ Zone____ State_____

Please ship

☐ *Life*-Time filter conversion kit **$6.95** (full flow, $13.95)

☐ Complete *Life*-Time filter, with element & housing for $12.95.

California residents 3% extra.

I enclose ☐ full price; you pay shipping

☐ $2 deposit, will pay C.O.D. charges

DEALERS AND DISTRIBUTORS

Write or wire to find out how you can cash in on the "invention that revolutionized the oil filter industry".

5 *reasons why* ACCOUNTANCY

offers you MORE MONEY . . . *and* SUCCESS!

REASON #1. If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Even back in "depression years," surveys showed that accountants earned more on the average than men in other major professions.

REASON #2. The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a profession offering wide opportunity—always—to the man who knows.

REASON #3. You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accountancy is open to all. Any man or woman of good intelligence, who enjoys figure work and is willing to follow LaSalle's systematic "problem method" plan, can rapidly qualify for a highly profitable, enjoyable lifetime career . . . and he doesn't have to finish his training before beginning to "cash in."

REASON #5. Without losing a day from your present work, you can prepare in spare hours at home, at low cost, under LaSalle's step-by-step "Problem Method" of "learning by doing." This famous plan accounts for LaSalle's remarkable record of having trained nearly 10 per cent of all Certified Public Accountants in the U. S. . . . and of having put many thousands of others into high-paying careers.

Send today for Free Sample Lesson and "Accountancy, the Profession That Pays." Learn about the five great fields of opportunity . . . and LaSalle's time-tested plan for helping men and women to rapid advancement, higher income, greater prestige and professional standing. The coupon below will bring this information to you—without cost or obligation.

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Dept. 983H 417 S. Dearborn St., Chicago 5, Ill.

Please send me, free of all cost or obligation, a sample lesson in Accounting . . . also, your 48-page illustrated book, "Accountancy, the Profession That Pays."

Name.....*Age*.....

Address.....

City, Zone, State.....

LIFT OUT WINDOWS

Weather tight! Balanced right!

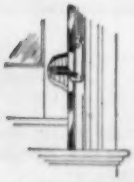
R·O·W windows lift out for quick, safe washing or painting *inside* the home.

They are weather-tight in all seasons because spring-pressure compensates for seasonal changes—insures a snug fit.

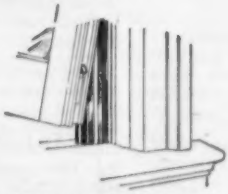
Equipped with LIF-T-LOX, they are beautifully balanced for easy operation. *LIF-T-LOX does not attach to the sash*—does not interfere at all with the wonderful lift-out feature.

REMOVABLE R·O·W® WOOD WINDOWS WITH LIF-T-LOX® WINDOW BALANCE

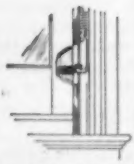
R·O·W is the registered trade-mark of the R.O.W. Sales Co.



In normal operating position, (spring-plunger above lock-tab) LIF-T-LOX balances sash for easy operation.

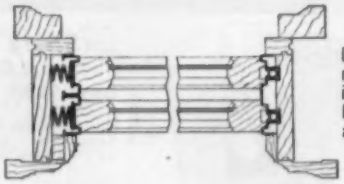


Upon removal of sash, lock-tab grips channel automatically—stays "locked" in position until sash is replaced.



Sash may be replaced in any position—spring plunger will automatically reengage when plunger is above lock-tab.

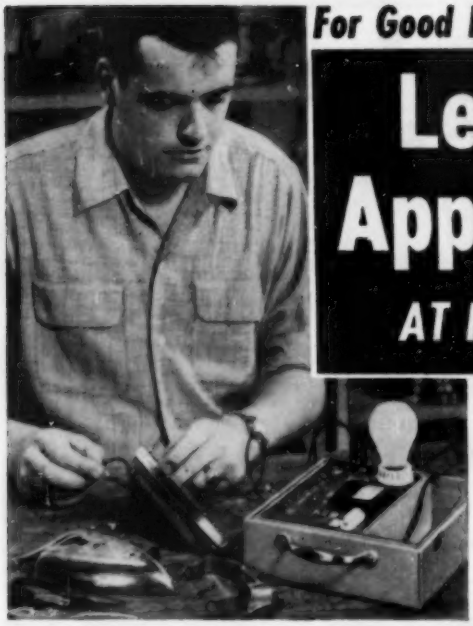
Details show minor October '55 changes



LIF-T-LOX, indicated on the right side here, does not interfere with the patented ROW spring-pressure mechanism shown on the left.

See your lumber dealer or write:

R.O.W. SALES COMPANY, 1387 ACADEMY AVE. • FERNDALE 20, MICHIGAN



For Good Pay, Interesting Work, Security

Learn Electric Appliance Repair

AT HOME IN SPARE TIME

Build a better future. Get into a field where there is important work and the security that comes from knowing a good trade. The electrical appliance repair business offers OPPORTUNITY FOR YOU. Every wired home today has an average of 8 electrical appliances. Up to 10 million new appliances are sold every year. Owners pay well to keep them in repair and enjoy the convenience they provide. That means there's a fast growing need for trained men.

Pick up $3, $4, $5 an Hour in Spare Time Starting Soon

Start soon to fix electric toasters, clocks, fans, vacuum cleaners, etc. for neighbors and friends. Spare time work done in your basement, garage, or spare room can earn you $3 to $5 an hour. See how easy it is to increase your earning power—how you can pay for this training many times over with spare time earnings.

Opportunities Increasing For Men Who Know This Profitable Trade

You may want to be your own boss so you can enjoy the profits of your business. Or you may want to qualify for the better job of Service Manager or Supervisor in an Appliance Servicenter. Or perhaps you want to supplement your income doing electrical appliance repairs in your spare time. Opportunity in this growing field is great. Send for free book and see what the Electrical Appliance field offers you!

Learn and Earn With This Appliance Tester You Get

This course includes the parts to build this sturdy portable appliance tester that helps you find electrical defects quickly and easily. You use it to learn and do actual electrical and appliance repair jobs. This multi-use tester helps you start making money soon after your training starts.

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Actual lesson proves our method is clear, practical. Book gives facts about Electric Appliance opportunities and details of our training. Act now to make your future more secure.

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Today's automatic electrical appliances need expert servicing. The man who knows a good trade like appliance repair has a secure future. Put your spare time to good use. Invest $2.50 down and $5.00 a month in a better future. Write Electrical Appliance Training, National Radio Institute, Dept. BJ5, Washington 9, D.C.

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City..... Zone..... State.....

APPROVED MEMBER NATIONAL HOME STUDY COUNCIL

DAYTONA BEACH. Chrysler Corporation cars sweep first and second places in National Stock car races. Chrysler "300" (top picture) breaks record in "Flying Mile" (127.58 mph) and 160-mile Grand National (92.05 mph). De Soto (below) speeds to first place over all cars in its displacement class (112.29 mph).

This, Too, Is THE *FORWARD* LOOK

Another part of THE FORWARD LOOK at Chrysler Corporation is the *finest engines* America has yet produced. Of America's passenger-car manufacturers, only Chrysler Corporation harnesses the extra power and efficiency of the hemispherical combustion chamber used in modern airliner engines. It is not surprising that these V-8 engines break speed and endurance records.

Since the marks shown above were set, 17 more first place wins have been chalked up, plus the dramatic victory at the gruelling Mexican Road Race in which Dodge swept the first *four* places over 37 other cars in its class! All told, Chrysler Corporation cars have rolled up enough firsts at tracks across the nation to completely dominate both NASCAR and AAA-sanctioned stock car racing events.

This exceptional performance is another reason for the public's great acceptance of the beautiful cars of THE FORWARD LOOK.

CHRYSLER CORPORATION

PLYMOUTH · DODGE · DESOTO · CHRYSLER · IMPERIAL

Copyright 1955 by Chrysler Corporation

Tops in TV drama—"CLIMAX!"—CBS-TV, Thursdays.

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

52-J DISTRICT NATIONAL BUILDING
WASHINGTON 5, D. C.

AFTER SHAVING

Dims Shine
Feels Fine
Doesn't Show

Also available in Canada

Finishing touch for every shave!
Neutral tint – crisp scent!

MENNEN
AFTER-SHAVE TALC
FOR MEN

Letters

More Than "Nurse's Aids"

We appreciate your well-intended publicity for the Hospital Corps of the Navy [June, p. 145, reporting a Corpsman on duty in a maternity ward], but we object to being referred to as "nurse's aids."

The Hospital Corps, made up entirely of enlisted personnel, dates back to the Revolutionary era when the surgeon's assistant was known as a "Loblolly boy." Its members are detailed to all activities of the Navy from the big research centers to isolated infirmaries. They receive basic Hospital Corps School training, on-the-job instruction, and often technical training in advanced schools.

The Corpsman's job is more than that of a nurse's aid.

George E. Jakway, HM3 USNR
Donald McKee, HM3 USN
Douglas Lorentzen, HN USNR
Frank F. Rafter, HN USN
Charles W. Owen, HN USN
National Naval Medical Center, Bethesda, Md.

The offending phrase was an awkward attempt to inject humor into the Navy's dry official release. The Hospital Corps' fine traditions and professional competence are well known to PSM editors, some of whom have benefited personally from its services.

Another Vote for Safe, Small Cars

I agree with Lee Hanson ["Letters," June, p. 14]. I fail to see the sense in increasing the horsepower of automobiles. Why not give the public more comfort and more safety—for the same or less money?

Recently I traded off my large powerful car for a 1955 Nash Rambler with 90 horsepower—but with air conditioning, overdrive and the rest. There is not a highway in America that I know of where I can drive this little car legally at its top speed. I am

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

McMORROW, BERMAN & DAVIDSON

Registered Patent Attorneys

PATENTS · COPYRIGHTS · PATENTS

142-H VICTOR BUILDING, WASHINGTON 1, D.C.

"In our family quality comes first. That's why I want Quaker State!"

Super-refined from Pure Pennsylvania Grade Crude Oil, world's finest. Famous for performance, protection, economy! Try it!

QUAKER STATE OIL REFINING CORP., OIL CITY, PA.
Member Pennsylvania Grade Crude Oil Association

enjoying the experience of its economy, short turning radius, and snappy response in traffic. I know it won't out-race the high-powered jobs that pass me so I am not tempted to make them prove their right to pass me.

Why not boost the smaller cars and encourage more safety features?

EDWIN G. SCOTT, Dallas

For more news of readers who value safety highly, see page 125 of this issue.

Pull That Line—the Other Way

Your picture of a man pulling a car out of beach sand with block and tackle [June, p. 173] showed him pulling toward the car

with the live line. If he reversed the tackle and pulled away from the car, his chances of getting the car out would be a lot greater.

JOHN H. HARRIS, Ramona, Calif.

Handle Records by the Edges

If you look closely at the picture with your article, "Label Saves Record Handling" [June, p. 206], you'll notice an unintentional mistake. The hand is holding the records on the grooves—very bad for the records. You should always hold a record on the outside edges and center; never touch the grooves.

SAM FAIN, Jefferson City, Tenn.

Self-Locking Glove Compartment

In your May issue [p. 108], a reader suggested that the glove compartments of cars automatically lock when the motors shut off. This I believe to be unwise. If someone lost his ignition key on a dark night and wanted to get his flashlight to hunt for it, he would be out of luck.

A/3C L. H. GREELEY JR.
Walker AFB, Roswell, N. M.

Phillips Screws Don't Need Wax

In the March issue [p. 194] you say "Beeswax rubbed in the slotted head will hold a screw on the screwdriver blade when you are starting threads in a hard-to-reach place." However, the screws shown in the

Train in Big Coyne Shops

GREAT OPPORTUNITY FIELDS!

Instructor helping students check the wiring and trace the circuits of television receivers

This big fire-proof building is occupied entirely by Coyne

Instructor explaining operation and testing of a large Motor Generator.

YOUNG MEN AND OLDER MEN—PREPARE FOR A CAREER WITH A FUTURE!

Conditions are changing. Many "one operation" jobs will not last. ***Don't be satisfied with a "no future" job.*** Whether 17 or up to 45 years of age, train the Coyne way for a better job and a real future in ELECTRICITY or TELEVISION-RADIO, ***fields that offer a world of opportunities.***

TELEVISION-RADIO

Here at COYNE you're trained for Television, Testing, Trouble-Shooting on Radio, Public Address, F. M. Sound Units, etc. Many **Coyne** trained men in good jobs or own well paying Television-Radio businesses of their own.

ELECTRICITY

Big future in Power Plant Work, Motors, Industrial Electronics, Armature Winding, Home and Factory Wiring, Appliances, Refrigeration, Maintenance, Illumination, etc. Lifetime job service to **Coyne** graduates.

WE TRAIN YOU IN CHICAGO

Our famous Practical-Technical method gives you practical experience on a massive outlay of equipment. Actual shop work plus necessary technical training. You are trained right here in the great **Coyne** shops. Send for BIG FREE BOOK.

APPROVED FOR VETERANS

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Enroll now, pay most of tuition after graduation. **Special plan for men of draft age.** We'll help you get part-time work, if you need it to help pay living costs while at Coyne.

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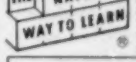

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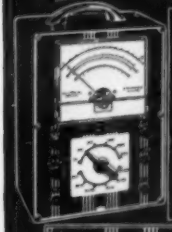

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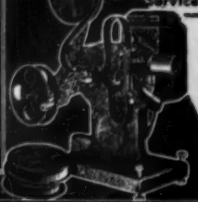

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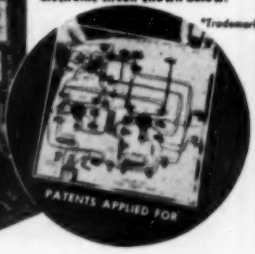

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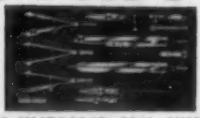

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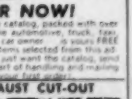

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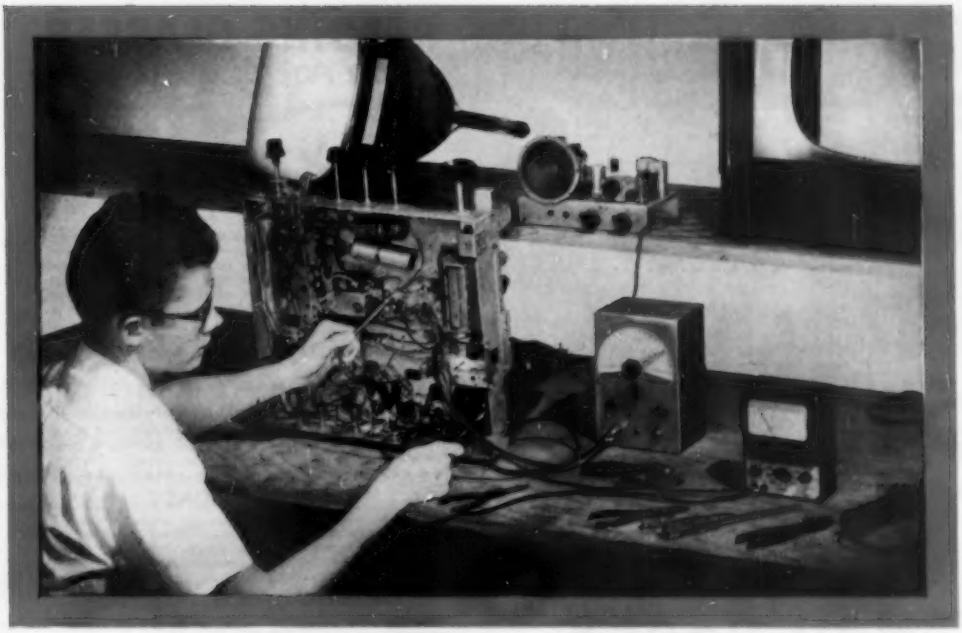

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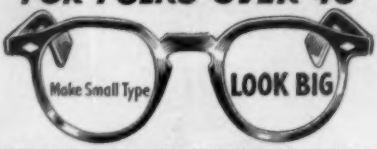

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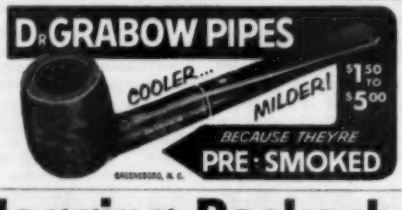

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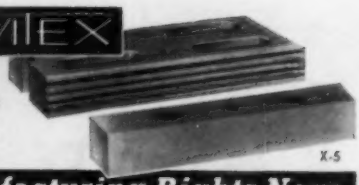

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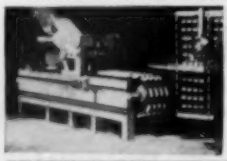

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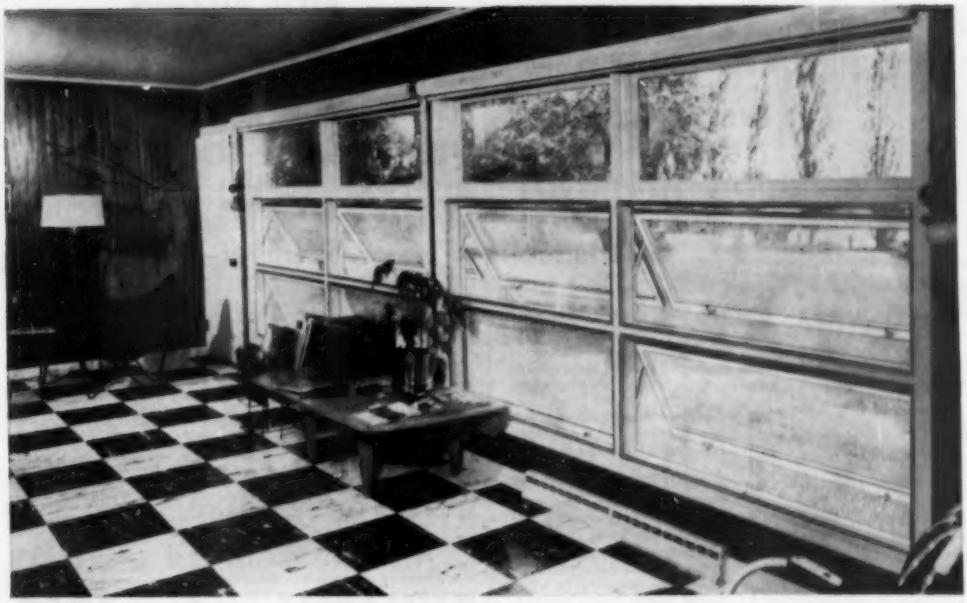

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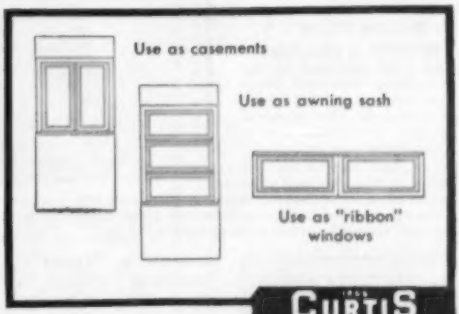

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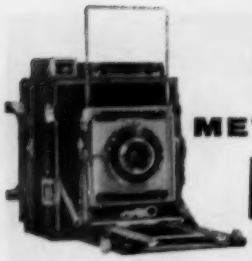
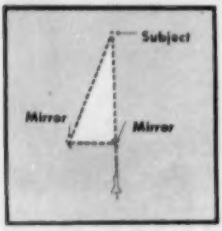
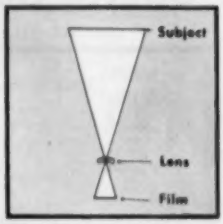


WHY 3 METHODS OF *Focusing* WITH THE GRAPHIC® 45?

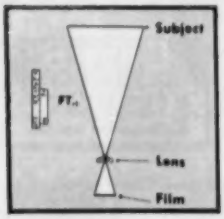
Three focusing methods are featured in the Pacemaker Graphic 45—one of many reasons why it is the most popular, most used all-purpose hand camera on the market. Let's examine these methods one by one.



1. Coupled Rangefinder Focusing with the new Graphic Rangefinder for normal eye level shooting—fastest method for all-around use. Interchangeable cams couple it to wide angle, normal or telephoto lenses. As you turn the focusing knobs on the camera bed, the two images seen through the Graphic Rangefinder window gradually merge until at the point of accurate focus of the lens, both images are superimposed, clear and bright. Built-in Rangelite for night focusing.



2. Ground Glass Focusing is the original and basic method of determining sharpest focus and subject matter to be included in the finished picture. It enables you to see: a) your picture exactly as it will appear in the print; b) what parts of your picture are in or out of focus; c) how you can improve framing or composition. Ground glass focusing is a "*must*" for the serious photographer.



3. Scale or "Guess" Focusing for quick "off the cuff" shooting—convenient for sports, action or ordinary snap shooting. You simply focus the lens with the focusing knobs on the front of the camera bed until the focusing scales on the bed indicate the estimated distance from the subject to the camera.

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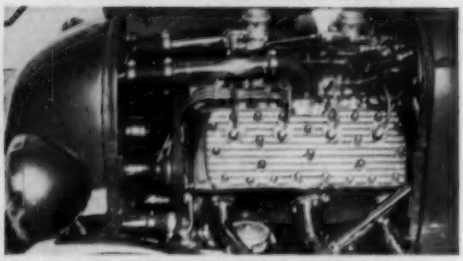

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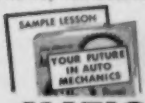

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650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
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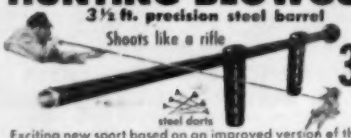

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If you are a victim of the above symptoms, the trouble may be due to Glandular Inflammation. A constitutional Disease for which it is futile for sufferers to try to treat themselves at home. Medicines that give temporary relief will not remove the cause of your trouble.

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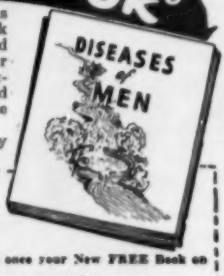

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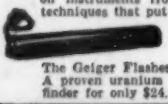

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Note electrodes closely A circular arcing area (four concave segments). Gap being the same from all points. Electricity has property of arcing from coldest point Current also arcs more readily from apex of two planes than from the face of a flat, metallic surface.

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allows overall cooler electrode temperature for greatly increased life. Hotter spark prevents fouling, yet the rotating and cooling effects minimize the common faults of burning, erosion, blistering and insulator failure. Compare this principle with the conventional 2-point spark plug design.

- **PLATONIUM-NICKEL ALLOY ELECTRODES**— *Metallurgists' first major step beyond platinum aircraft plug electrodes Arcing points of this material have continued to function after the equivalent of 120,000 car-miles.*
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Dealers and Distributors: *The LIFE-TIME Spark Plug is now in full production Write for full details. Distributors. Please inquire as to status of your territory.*

50,000 CAR MILES!

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this registered set of LIFE-TIME Spark Plugs in proper series (heat range and gap) for the car you indicate in coupon. NOW AVAILABLE FOR AMERICAN & EUROPEAN PASSENGER CARS, TRUCKS, BOATS, FARM EQUIPMENT, INDUSTRIAL ENGINES.

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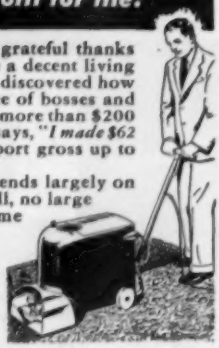
not everyone does as well, but E. O. Lockin, who started a business of his own, reports...

for 12 months I've averaged $800 PER MONTH INCOME — most of it clear profit for me!



• Mr. Lockin expresses his grateful thanks for the opportunity to make a decent living on his own. Many men have discovered how to be independent, to be free of bosses and layoffs. L. A. Eagles grossed more than $200 his first week. R. E. Traynor says, "*I made $62 gross in one day.*" Others report gross up to $12,000 per year.

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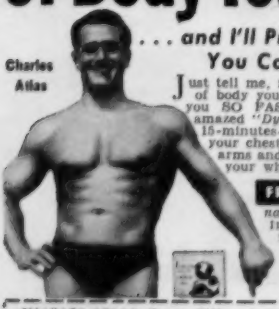

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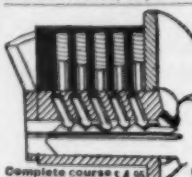

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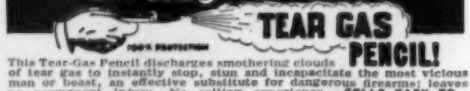

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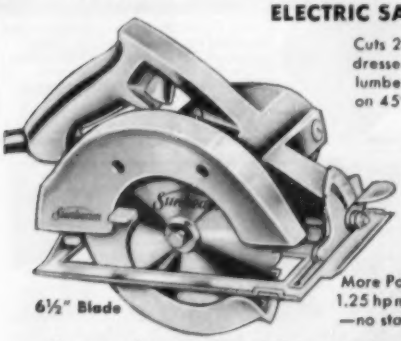

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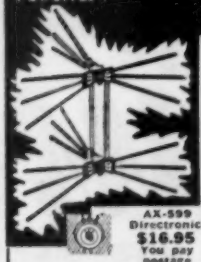

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I have proven this plan with 103 imports – and the opportunities for the sale by mail of thousands more are breathtaking in their possibilities. Hunting knives and binoculars from Germany, silverware from Sheffield, England – hand-carved art objects from Africa – all costing less than $1 abroad have values up to $5 or more here and are big sellers by mail order.

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Mrs. McGinn, one of my students in Illinois, operates a gift shop and sells Arabian perfume by mail order. F. Basler, N. J., sells Aztec bird feather pictures from Mexico to stores and by mail order.

You might ask, "Why do you let others in on your plan? Why don't you keep it all for yourself?" The answer is that items for import are countless. No one person could possibly handle even a small proportion of them. There's plenty of business in import-export for you and me and many others.

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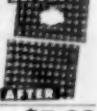

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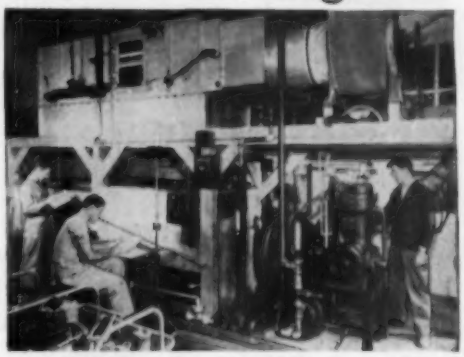

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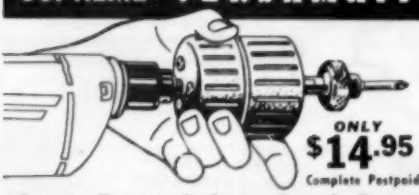

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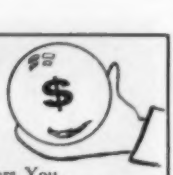

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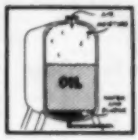

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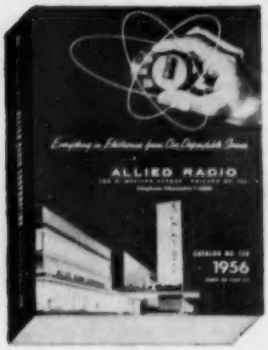

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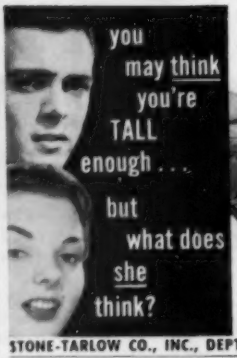

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640-15	4.81	800-15	5.11	900-20	15.61	700-15(6)	7.21
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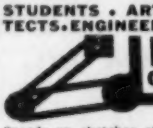

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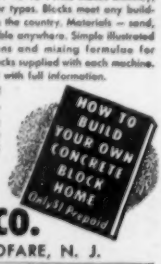

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By James R. Mason

What a fellow makes in his regular job today is hardly enough to make ends meet. Higher taxes, higher costs of food and rent and almost everything else raise hob with the savings account. And I say that what a fellow puts away is even more important than what he makes. It would worry me sick if I couldn't save a little against a rainy day.

And that makes it almost necessary to make some extra money. There are lots of ways to do it, too. The magazines and newspapers are full of ads for agents to sell things. But if I had to make a living by selling, from house-to-house, I'm afraid I'd starve to death. I like to make something with my hands and either sell it by mail or let the stores sell it for me. There are lots of people like me.

Another thing: Lots of men—and women, too—don't want to get mixed up with something that might hurt them on their jobs. They want a plan they can operate at home—in spare time—one that they can work at any time they please and one that doesn't need any rented store or hired help. And that's where my little money maker rings the bell.

Let's say you're like me. You want to make some extra money but you don't want to do any selling. All right—take a look at what you can do with this machine. I'll give you some facts that I discovered and your own common sense will tell you they're true.

If you're going to make something, it ought to be something that lots of people want—something that lots of people buy. It shouldn't be something that sells at just certain seasons—but all year 'round. And, it shouldn't be any flash in the pan. It's got to be steady—year after year—something that's not here today and gone tomorrow.

Well, give a thought to this: What's more permanent than babies? Ever since I can remember there's been more and more babies born every year. Last year three and a half million. This year more. Next year, more yet. Then answer this question and tie it in with your thinking: What's stronger than mother's love for her baby? And what is more powerful than love or sentiment in making people buy things. Now you've got the idea.

Every year millions of mothers want their babies' first shoes preserved as mementos. These mothers have the shoes "bronzed" as they call it—by electroplating. Electroplating coats the shoes with copper and preserves them forever. And there's no big company that has a corner on the business of metalizing baby shoes. Almost all of this work is done by little fellows in their kitchens or basements. Lots of orders come to you by mail when you send out circulars letting mothers know you can do the work. Lots of stores take orders, but they have to turn over the work to you. There are six or seven ways to get orders without making any house-to-house calls. The big job is keeping up with them.

You see, you can clean up six pair of shoes in a few minutes. In a few minutes more you can dip them in the hardening solution like you see in the picture. Then you spray them with a conductive coating and hang two pair in the tank on copper wires. Just turn the switch and walk away. The machine does the rest. Eight hours later those shoes are ready to take out of the tank, burnish and mount and ship or deliver. Two pair every eight hours, whether you are asleep, awake or at the movies. The materials cost 54c a pair. The retail price you get for electroplating is $6.00—so the profit is more than $5.00 a pair. Since you can do six pair a day you can see what the profit is, and the beauty of it is that the machine doesn't cost much. Almost anyone can afford the equipment and the book you get tells how to run the machine and how to get orders. Anyone can follow the instructions.

Of course, there's a lot more information than what I can give here. But write me a note or send me a postcard with your name on it and I'll send you all the information right away by mail. I'll show you how to start; what you need to buy; where to get it at the lowest price; how to get orders coming in seven different ways; and everything you want to know about the business. When you get all the facts, you can decide whether you want to get a "little money maker" of your own. Everything I send you now is free—no charge and no obligation. I'll be glad to help you get a start. Address me, James R. Mason, 1512 Jarvis Avenue, Chicago 26, Illinois. There's no catch to it. No one will call to try to sell you anything. I'll mail everything free, postage prepaid. Then you can decide. Write to me right away so I can help you get started making money.

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60 FOR INVENTORS

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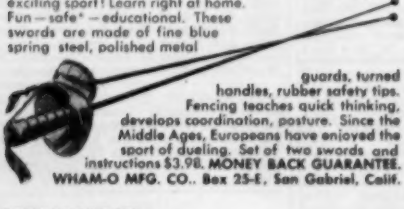

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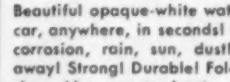

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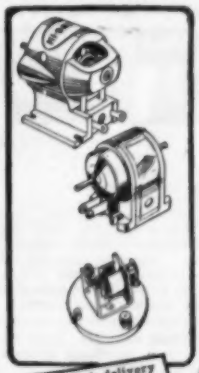

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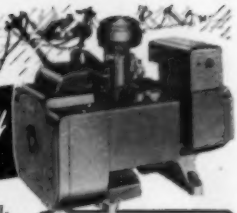

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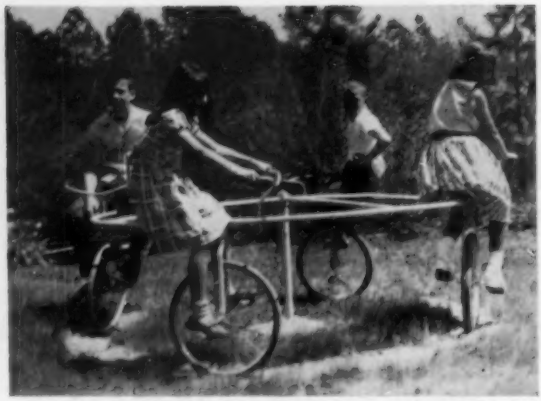

Four-Cycle Merry-Go-Round. The front ends and seats from four junked tricycles were welded to a circular frame of steel tubing to make this novel back-yard toy. Four spokes in the frame meet at a center hub that pivots on a pipe set in cement. The builder, C. A. Cole of Graham, Ala., says the rig keeps the kids happy even though they get nowhere.

Model Cruiser Is Crisp Craft. Already clocked at 25 m.p.h. on a test run, this four-foot model is expected to hit 35 m.p.h. when fitted with a new propeller and rudder. Bert Parker of San Diego, Calif., built it after a design perfected by his grandfather, a master shipbuilder. Next he plans a 22-footer built along the same lines. The gas engine Parker is holding was sent to him by his son in Japan.

Literally a Drum Table. When Richard L. Lint of Elkhart, Ind., decided to build a drum table, he did just that. He bought a second-hand drum, removed every other hoop clamp around the bottom and inserted rubber-tipped steel rods in the clamp sockets for legs. The top drumhead was varnished.

Boy Grows Up. Twelve years ago Jae D. Kitchen of Caro, Mich., with some help from his five-year-old son Dick, built a model steam-driven oil well that really pumped oil (PSM, Nov., 1943). Now Dick, with little aid from his father, has completed another shown at right below—a realistic modern diesel rig operated by two electric motors.

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Many hobbyists have been wondering how professional painters get those beautiful natural wood finishes. The magic word is Satinlac! Satinlac gives a handsome, satiny effect which wears well and is easy to maintain. Dries so quickly it's ready for the next coat in just 3 or 4 hours. In a jiffy you have a "custom-finished" job!

Clear Firzite tames Wild Wood Grain!

Now it's easy to give fir plywood the appearance of costlier woods. When staining, start with a coat of Clear Firzite. It soaks into the wood pores and subdues the wild grain. Practically eliminates grain raise and face checking. For oak, walnut and mahogany stains, add colors-in-oil.

Weldwood has a Right Glue Fo

The kes the job often save mber, there ally r cle. hoice o th glue maker mak and remember specially tackle. choice of s sts cause they're the hoice men who know glues best . .

New Way to Bond Micarta without Clamps or Presses!

Now, it's really easy . . . even for an amateur . . . to apply plastic surfacing materials like Micarta to table tops, kitchen counters, bathroom and powder room surfaces. Sensational new Weldwood Contact Cement bonds instantly and permanently on contact—without clamps or presses. Has a thousand and one other uses around home, shop or garage. Also . . . it enables you to put up plywood without nails. This Wizard with Wood bonds all combinations of wood, cloth, leather, paper, glass and metal (including do-it-yourself aluminum).

Blond Finish on Furniture? Use White Firzite!

Now you can give furniture a blond woodsy finish without a "painty" or artificial look! Finish it yourself with White Firzite. This Wizard with Wood is equally wonderful for getting an eye-catching pickled finish. For tinted effects add colors-in-oil. (On soft wood or fir plywood paint jobs, White Firzite as an undercoater helps prevent grain raise and checking.)

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POPULAR SCIENCE MONTHLY'S . . . **Last-minute news & notes**

TOMORROW'S BUILDINGS MAY BE SUPPORTED BY AIR, says the Cornell Aeronautical Laboratory. Research on radomes, inflated glass-fiber bubbles that shield radar apparatus from arctic storms, indicates that large commercial structures such as fair buildings, auditoriums and warehouses could be built for less than half the price of conventional steel-supported structures. Roofs would be held up by air pressure...HOW DOES A FISH STAY ON COURSE, even when swimming hundreds of miles? Probably by orienting itself to the polarized light filtering down, says Yale zoologist Talbot H. Waterman. The eye of the fish acts as a built-in automatic pilot...CONTAMINATED WATER CAN BE ECONOMICALLY STERILIZED BY ULTRAVIOLET RAYS, says Westinghouse scientist Dr. Rudolph Nagy. A new, cheap lamp can compete with chlorine in purifying.

TUBULAR BUMPERS MAY APPEAR ON ONE 1957 CAR. They would consist of alloy-steel upper and lower horizontal tubes, joined at the ends by half circles. Advantages: greater vertical protective area, light weight, low cost...A COLORED ANTENNA FOR YOUR CAR --maybe to match the changeable colored sidewalls on your tires--is the latest development in the race by auto-accessory manufacturers to make every car look like a rolling rainbow.

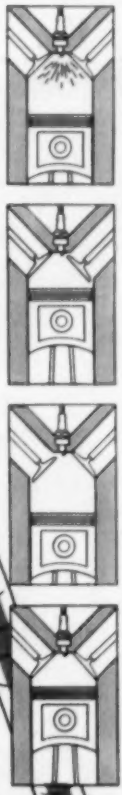
Historic Picture

WHAT'S DOWN AT THE BOTTOM OF THE SEA? A Navy photograph (left) taken at the greatest depth ever recorded--20,800 feet--reveals just what everyone had always suspected was there: mud! The holes were made by unidentified marine creatures... AN ANTISEPTIC THAT APPROACHES THE SURGEON'S IDEAL has been developed, reports Dr. Wilson A. Swanker in the American Journal of Surgery. Used for preoperative skin preparation, Clorpactin kills germs fast, but won't harm the tissues of the patient or cause any toxic reaction.

PILOTS OF HIGH-POWERED, NOISY AIRPLANES MAY TALK THROUGH EAR MICROPHONES in the future, three Ohio University scientists believe. When mouth and nose are covered by a baffle box, speech sounds can be heard coming from the ear clearly--in fact with 129 percent more intelligibility, in the presence of a high level of noise, than speech from the mouth.

If you put a thermometer in your engine...

...you would get this "inside story" on the AC Hot Tip!



Install a new set of HOT TIP AC SPARK PLUGS every 10,000 miles!

AC Insulator Tips Get Hot to Stay Clean Longer!

When each cylinder fires . . .

AC Spark Plug tip temperatures rise rapidly. At these temperatures, carbon and oil deposits are burned away as soon as they form.

Exhaust stroke . . .

AC's thin-tip design allows combustion left-overs to be cleared away by a cyclone of hot, swirling gases.

AC Insulator Tips Cool Fast to Avoid Pre-ignition!

Intake stroke . . .

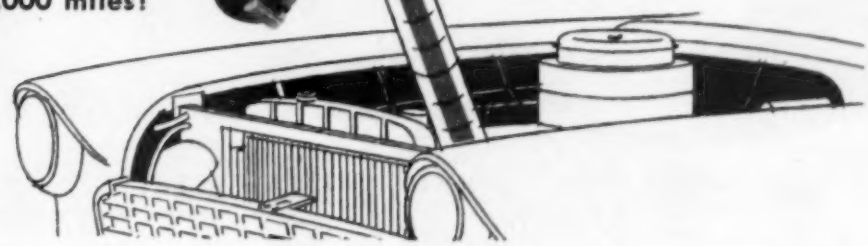
The rushing intake of cooling gas drops tip temperature of thin-tip ACs faster and farther than is possible with thick-tip plugs.

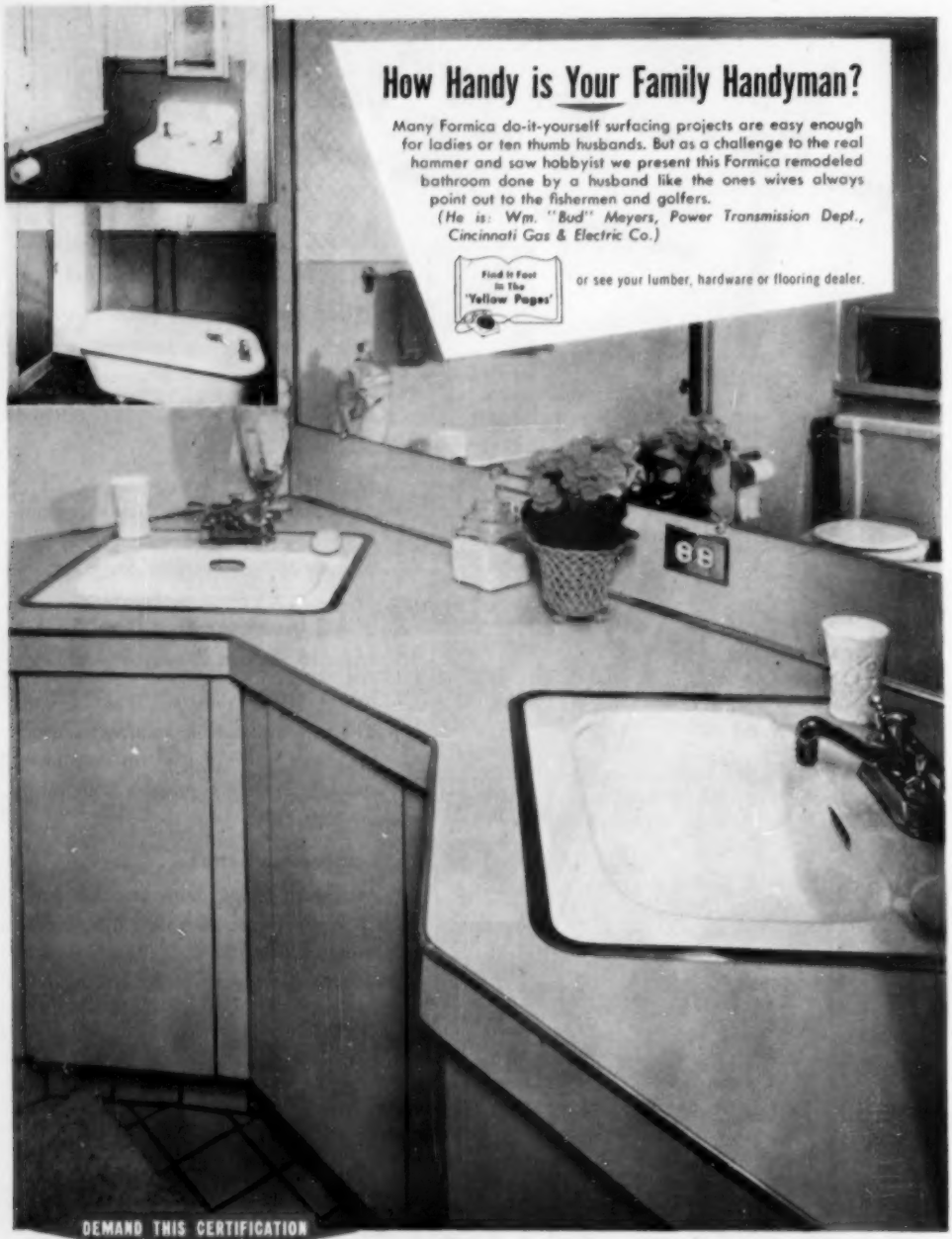
Compression stroke . . .

AC Spark Plugs, with low insulator-tip temperature at this point, vastly lessen chances of pre-ignition — a common problem with ordinary plugs.

GM GENERAL MOTORS

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION





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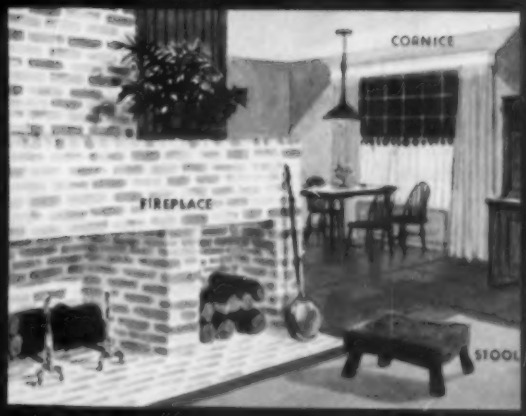
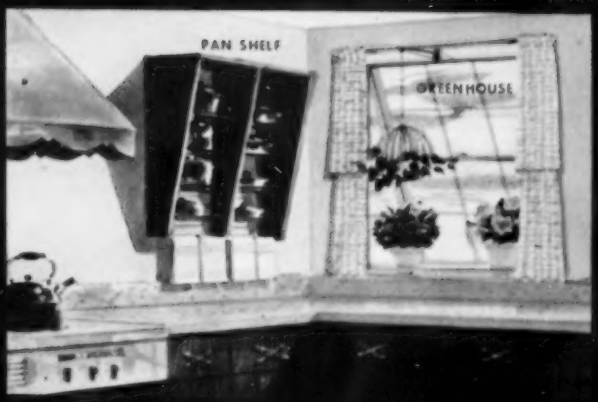
TWELVE WAYS TO

GIVE YOUR HOME A NEW LOOK





Whether you want to start work outdoors or in, upstairs or down . . . Whether you prefer to do-it-yourself or hire it done . . . Here are a dozen practical projects that will add beauty, comfort—and dollar value—to your home.

Add a carport

STANDARD-SIZE plywood panels fall into place like prefab parts when you build this modern carport. There is practically no roofing or siding waste, and you can save on the cost of the masonry work by making the roof panels do double duty as concrete forms.

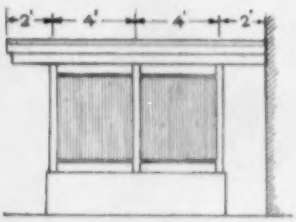
Whether you want a single port with a 10′-by-18′ car area, or a 20′-by-18′ double port, the basic framing is the same.

Dig trenches below the frost line for the side and rear footings. Line up forms, using ¾″ exterior-plywood panels. Oil their inside surfaces before pouring the concrete. Let a ready-mix truck supply the muscles for this job, which calls for approximately two cubic yards of concrete for a one-car port, or three cubic yards for a double port. (You'll need another two or four cubic yards for the floor, later.) Specify a mix of 1 part cement, 2¾ parts sand and 3 parts gravel.

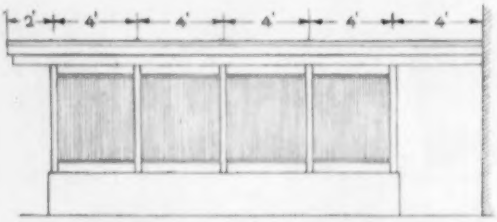
Insert ½″-by-5″ steel pins at the upright post locations, while the concrete is still soft, to hold the posts in position when they are applied. Or if you want an even stronger anchor for the uprights, omit the pins and insert ¾″-by-10″ bolts, heads down, in the soft concrete at 2′ intervals.

Let the concrete set for 24 hours, use the bolts to attach 4″-by-4″ sills to the walls and spike the posts to these. Remember to apply creosote to any wood surface that contacts masonry.

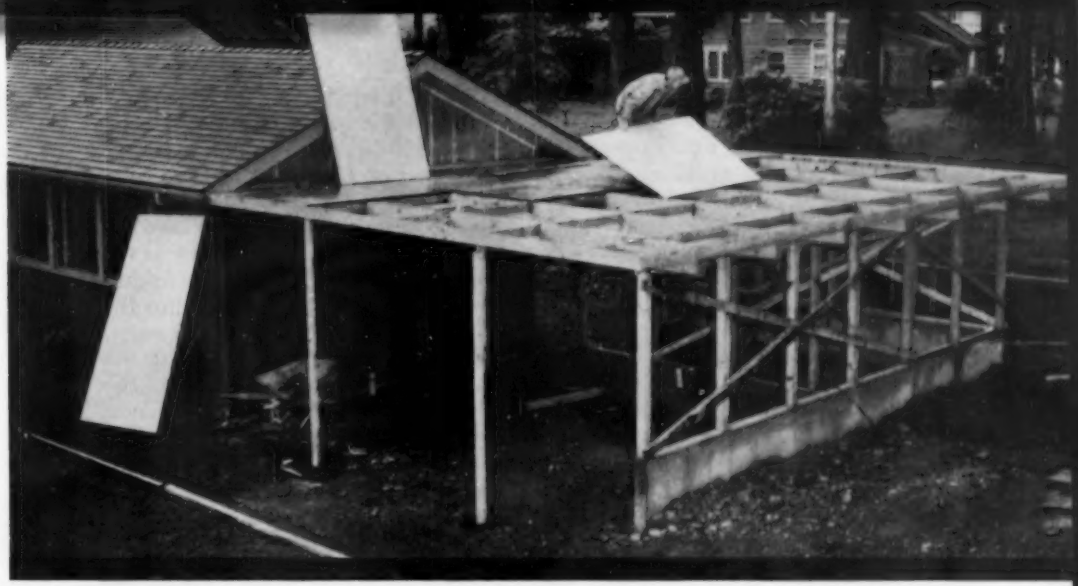
Before erecting the posts, apply an



REAR WALL OF SINGLE CARPORT

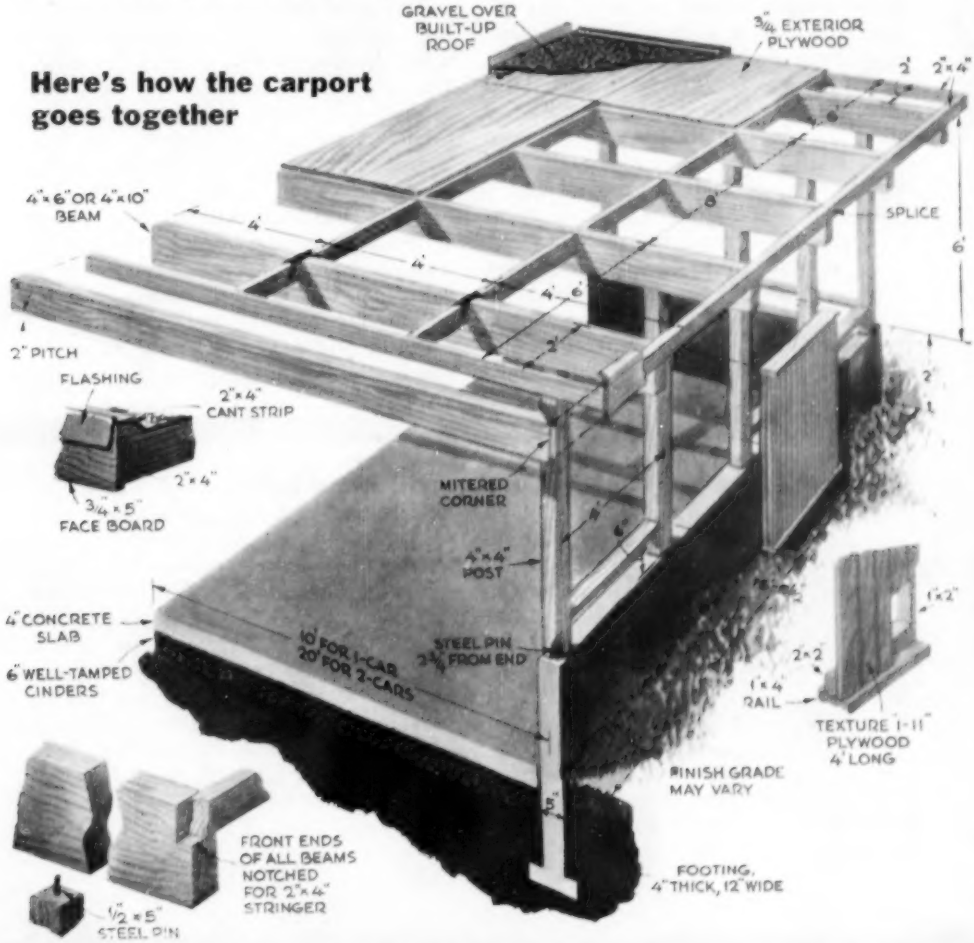


REAR WALL OF DOUBLE CARPORT



DOUBLE CARPORT, above, designed and built by the Douglas Fir Plywood Association, uses the same framing scheme as the single port shown below, except for the roof-runner spacing and the addition of a large work and storage space at the rear.

Here's how the carport goes together



anchor rail to the side of the house to support the inner ends of the roof beams. The method used for this carport is shown in one of the detail drawings. Here, a section of siding and sheathing was removed and the rail segments were recessed between the studs. Or you can remove one strip of siding and fasten on a continuous rail with 8″ lag screws through the sheathing and into the studs.

On a solid masonry wall, drill holes for screw anchors and attach the rail with lag screws. If the wall is made of less substantial brick veneer or cinder block, you should anchor 4″-by-4″ uprights to the wall to give added support. If there are no doors or windows to consider, set one post under each roof-beam location. In any case, use at least four upright posts.

Next, cut the free-standing posts for the outer side and rear of the carport. Their lengths should be such that the roof beams have a 2″ downward slope away from the house for a single port, or a 4″ slope for a double port. Drill holes in both ends of each post if steel pins have been embedded in the concrete walls, or at the upper ends only if the posts are to be spiked to sills.

Cross-brace the posts to hold them firm while you frame the roof. Drill ½″ holes in the undersides of the roof beams (4″ by 6″ for a single port, or 4″ by 10″ for a double port), and anchor the beams to the posts with steel pins.

With the beams and uprights firmly aligned by the pins, toenail spikes from the sides of the beams into the posts, or tie the ends down with plumber's pipe strap nailed over the tops of the beams and down the sides of the posts.

Nail sections of two-by-fours between the beams to give edge support to the plywood panels. A single port requires three 4′ widths plus one 2′ strip for the overhang. Unlike the outside stringer, which is continuous, the sections of the intermediate stringers that support the overhang at both ends of the port should be braced with joist straps attached to the beams.

Apply roof panels oiled-side up. Space the nails 6″ apart along all roof edges, and 12″ apart along intermediate beams and runners. Finish off the exposed edges of the roof with ¾″-thick face boards, setting their top edges flush with the upper surface of the plywood.

The most durable roof covering is a built-up sandwich of tar and felt, with a top dressing of slag. Laying down this type of covering is a job best left to a professional roofer, but you can do the preliminary work by capping the face boards with two-by-fours beveled on the inside edges at a 45° angle for the flashing. Drill holes through the plywood at the two outside corners of the roof for downspouts and insert elbows from below so the vertical leaders can be anchored to the end posts.

For a less expensive roof covering which you can install yourself, omit the

These are the materials you will need for:

A SINGLE CARPORT

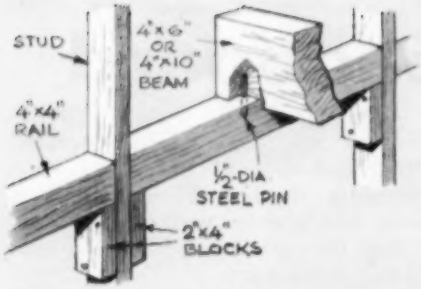
PIECES	DESCRIPTION
3	panels ⅝″ exterior plywood, 4′ by 8′
6	panels ⅝″ exterior plywood, 4′ by 6′
9	panels ⅝″ Texture 1-11 exterior plywood, 16″ by 8′
5	four-by-sixes 13′ long (beams)
7	four-by-fours 6′ long (posts)
9	two-by-fours 16′ long (runners and cant strips)
1	two-by-four 8′ long (runners)
4	¾″-by-5″ face boards 12′ long
3	two-by-twos 16′ long (stops)
3	one-by-twos 16′ long (stops)
3	one-by-fours 16′ long (rails)
19	steel pins ½″ by 5″
6	joist straps

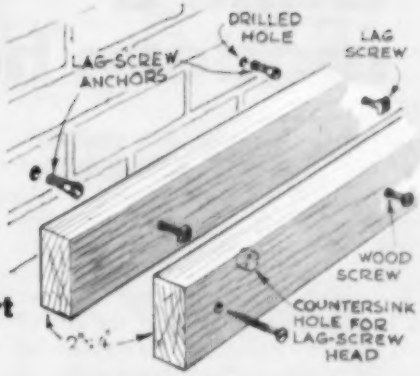
Anchor rail, concrete, flashing, roofing material and downspouts as required.

A DOUBLE CARPORT

PIECES	DESCRIPTION
5	panels ⅝″ exterior plywood, 4′ by 8′
10	panels ⅝″ exterior plywood, 4′ by 6′
2	panels ⅝″ exterior plywood, 2′ by 6′
1	panel ⅝″ exterior plywood, 2′ by 8′
12	panels ⅝″ Texture 1-11 exterior plywood, 16″ by 8′
5	four-by-tens 23′ long (beams)
9	four-by-fours 16′ long (posts)
14	two-by-fours 16′ long (runners and cant strips)
3	two-by-fours 8′ long (runners)
3	¾″-by-5″ face boards 16′ long
4	two-by-twos 16′ long (stops)
4	one-by-twos 16′ long (stops)
4	one-by-fours 16′ long (rails)
23	steel pins ½″ by 5″
12	joist straps

Anchor rail, concrete, flashing, roofing material and downspouts as required.





Two ways to fasten a carport roof at the house end

ROOF BEAMS ARE SUPPORTED, at the house end, by a horizontal anchor rail. Drawings show how the rail is attached to a frame house (above left) and to a masonry wall (right).

edge flashing and apply roll roofing, laying the bands in the direction of the roof slope and lapping the edges of adjacent bands by at least 2". (If the bands are laid parallel to the house each lap may form a dam which will pocket water.) For a water seal on a frame house, pry up the lower edge of the clapboard or course of shingles just above the roof line and insert at least 4" of the roll roofing between the building paper and the sheathing. A strip of cove molding nailed to the roof edge under the roll roofing will prevent the material from cracking when it is bent to the plane of the roof top.

On a masonry house, butt the roll roofing against the wall and use a strip of cove molding to cover the juncture. Before nailing it down, coat the vertical face of the molding heavily with calking compound and press it firmly against the wall.

Seal all roll-roofing laps with roof cement and nail them down with flat-headed shingle nails placed 3" on centers. Then cement over the nails. Allow a 1" overhang on each of the exposed roof edges, so the roll roofing can be turned down and nailed to the sides of the face boards.

With a roof of this type, attach a continuous eaves trough to the three face boards. Cap the inner ends and apply the necessary downspouts.

Any time after the roof is finished, you can puddle the concrete carport floor and apron without running the risk of having it pockmarked by an unexpected rainstorm. Use the same mix you did for the walls. If it is poured over a 6" bed of well-tamped cinders, no reinforcing rods are needed for a cement slab 4" thick.

To enclose the sides, use ¾" plywood. The type shown is a deep-grooved design called "Texture One-Eleven," that has lap-joint edges.

Cut standard 16"-by-8' sheets to 4' lengths for the wall sections. You need three of these 4' lengths for each wall panel—one of them with the lap edge trimmed off and the opposite sheet cut to a snug fit between the posts. To hold the panels in position, nail 1"-by-2" vertical stop strips to the posts and 2"-by-2" horizontal stops between them. The edge rails that complete the panel frames are cut from 1"-by-4" stock.

Apply shingle-type stain to the wall sections and paint the framing to match the trim on your house. END

Build a modern headboard

SLIDING glass doors give this headboard a custom-made look. Behind the translucent panels is a neatly concealed space for storage. Fluorescent lighting could be installed inside as a luxury touch. Square cuts, without a curve in a carload, make construction easy.

A local glass shop will cut the corrugated glass for you. Don't worry about handles—the flutes afford finger grip.

You can place the headboard against a wall and push a headless bed against it. For this use, the headboard legs can be plain 2″-by-2″ posts. If you want to hook bed rails on, chisel a recess in each leg and drive in pins to suit the rail hooks, or use legs from an old bed.

For a natural finish, hardwood-veneer plywood is recommended. But fir plywood will do if you plan a painted finish.

Miter together two pieces for each end base, using glue, four-penny nails, and angle brackets or corrugated fasteners. Attach one base to each leg with cleats, as shown, or with angle brackets.

Glue and screw the 8″-wide plywood uprights to the legs. Then fasten both lower end shelves with glue, screws through the uprights, and finishing nails driven into the bases.

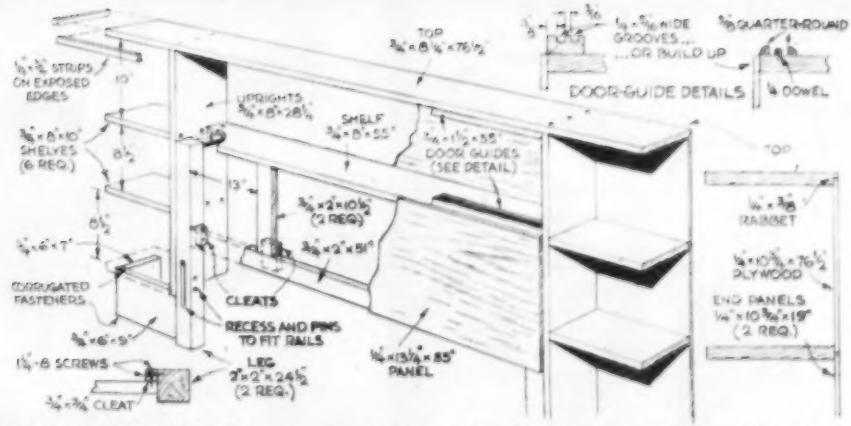
Screw a cleat across each upright, flush with the top of the leg. Attach each of the short outside shelves with countersunk screws from inside. Fasten the long shelf to each leg and cleat with wood screws.

Groove hardwood strips for the door guides, or build them up from quarter-round molding and ¼″ dowel or strips (predrill the dowel for brads). Order the glass 9″ wide for grooved guides, 10″ wide for the built-up kind.

Sink all nails and fill the nail holes. For a natural finish, cover the exposed plywood edges with strips ripped from solid wood, as in the drawing, or paste on the new self-adhering edge strips now available.

MOUNT BACK PANELS with glue and six-penny finishing nails. The long panel goes clear across. Short vertical panels beneath reinforce the end shelves. The framework behind the front panel is visible here from the rear.

NAIL UPPER DOOR GUIDE first to the underside of the top. Then set 9/32″-thick fluted obscure-glass panels, one 27½″, one 29″ long, into top guides. Slip the lower guides onto the glass and nail them to the shelf.

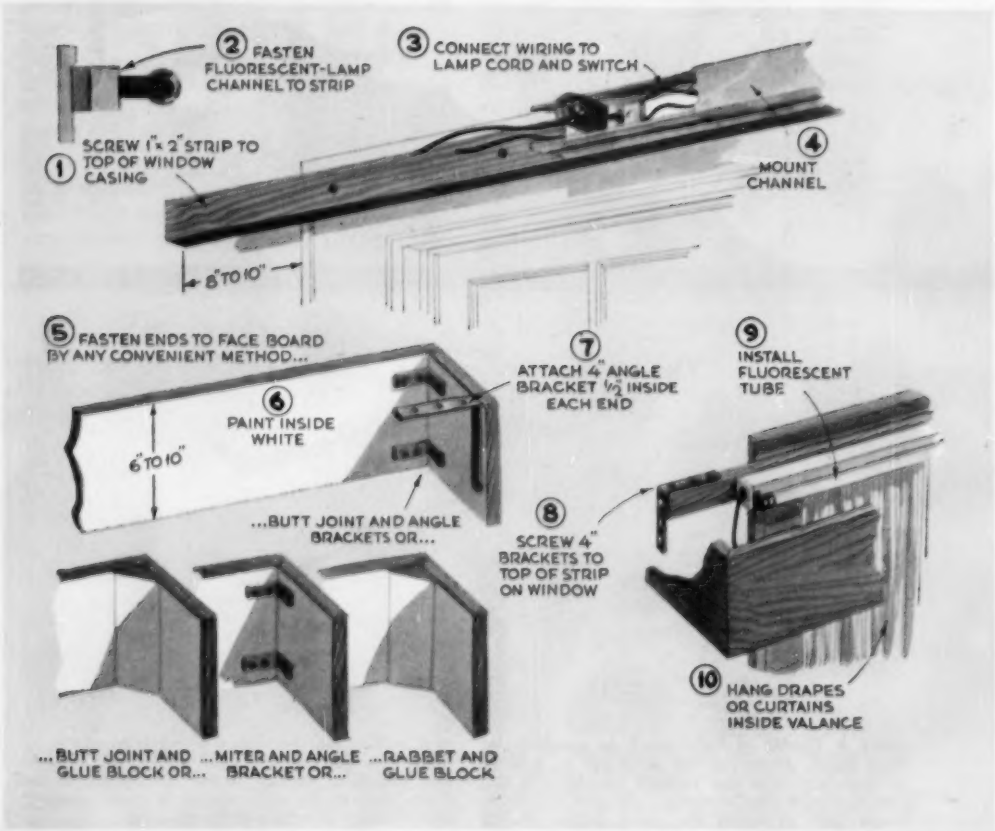


MAKE A FRAME of light stock to support the front panel, fastening the stretcher to a cleat on each leg. Join the vertical members to the stretcher with cleats behind. Use glue and fourpenny nails to mount the panel. Before gluing and nailing on the top, cut a rabbet along its back edge for the long back panel. The vertical end panels are nailed to the rear edges of the short shelves at each side (at right above), and to the rear edges of the uprights.

LET there be light if you want windows to brighten a room by night as well as day, and add a touch of distinction.

Fluorescent fixtures are made to order for cornice lighting. Their installation calls for little more than driving a handful of screws. Typical fixture lengths are 24", 36" and 48". By grouping two or more, you can span any window length. Connect them by running lamp cord through a feed-through switch to the nearest socket. For warm room tones, experts recommend "warm white" tubes.

Light up a window



Use stock materials from the lumberyard to build the cornice. Leave the top open to shed light upward as well as down. Paint the inside white to increase light reflection.

There is ample scope for individuality in decorating the cornice. You can buy boards precut to attractive contours, or jigsaw your own. Dress up a plain board by nailing on half-round or other stock molding, or more elaborate machine-carved molding. An interesting shadow effect is achieved by using thin trim boards, which come precut to a variety of patterns.

cornice

TO REPAIR A POTHOLE, mix grout, mastic and water to a thick soup and pour into hole (upper photo). Then, while still wet, trowel the surface smooth (lower photo) and let cure as maker directs, usually two days. Other dry-mix patches are simply tamped into place.

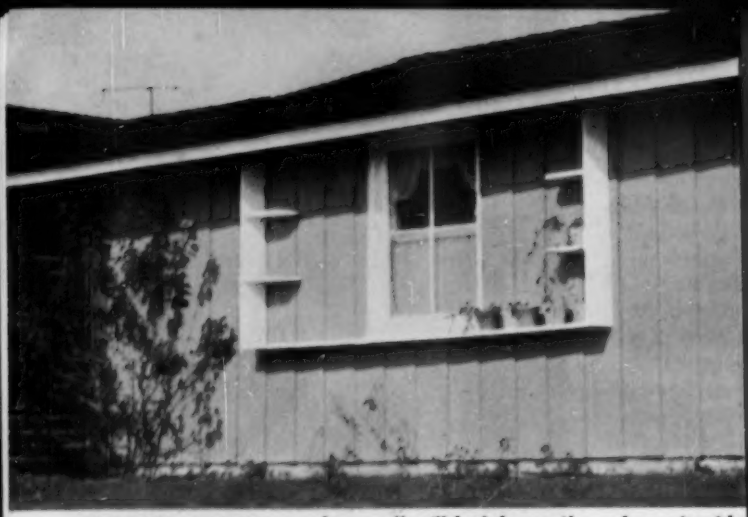
Patch the driveway

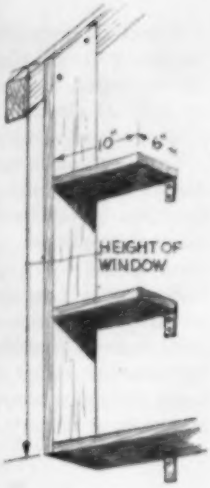
YOU can now repair untidy potholes in an asphalt driveway by applying cold patches, using a prepared mix.

Some mixes come ready for use. You just tamp them in. Others are packaged in two containers—black asphalt mastic and grout. You simply mix the two ingredients with water.

Sweep the hole clean, removing all dust or grease that might interfere with the bond. Also remove any base material that is soft, wet or spongy. Replace it with crushed rock, gravel or the same kind of material that you will be using for the surface.

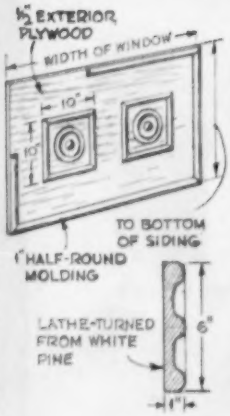
A patch can sometimes be feathered out over the adjoining paving, but cutting the hole edges for a vertical joint is better. After the patch has set, a dusting with sand will bring it to the color of the rest of the driveway.



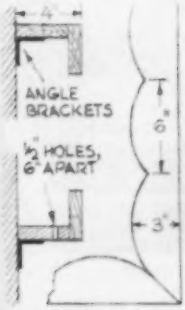


ONE LONE WINDOW on a long wall will look larger if you frame it with these shelves for potted plants. Hang sidepieces from roof rafters, if exposed, or from metal angles screwed to the underside of eaves. Make the frame about three times as wide as the window.

Dress up a plain window

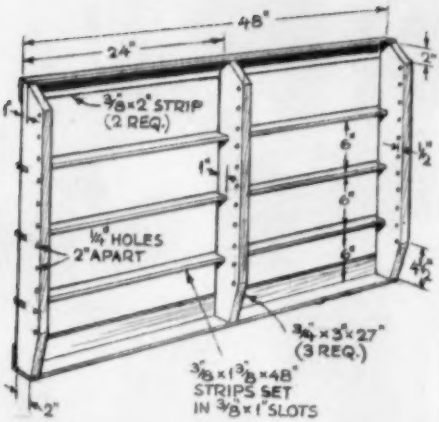


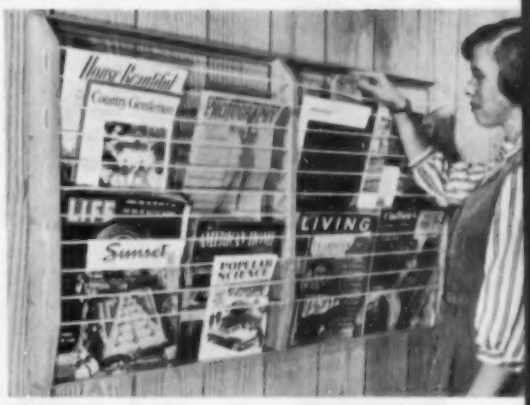
WINDOW "APRON" gives you a base for decorative plaques or rosettes. It also keeps window paint from washing down on darker house paint below. Use waterproof plywood and calk gaps over uneven shingles or clapboards to keep out moisture. You can tack on plain modern squares or buy ready-made rosettes if you'd prefer to skip a troublesome lathe-turning job.



SCROLL-SAWED BORDER pairs two plain windows in a fancy frame. Cut the scalloped facepieces first so you can tell where the joints will fall, but don't nail them on until frame pieces have been screwed to house. You can adjust height and width of frame slightly to make mitered corners fall on matching parts of the scallops.

Brighten a wall with a magazine rack





THIS magazine rack adds life and color to a bare wall. The one shown is four feet long, but you can make it half the size to fit a small space or add extra sections for a family of heavy readers.

Cut three identical pieces ¾″ by 3″ by 27″ for the sides and center divider. With the pieces clamped together, bevel the ends, cut the ⅜″ slots for the cross strips, and drill the ¼″ cord holes.

To hang the rack, screw the two flat backstrips to the uprights and use these in turn to screw the rack to the wall. The horizontal strips form shelves to hold different-size magazines and are glued and tacked in place.

String the rack with plastic clothesline, stretching it taut from side to side, and tuck the ends under several loops.

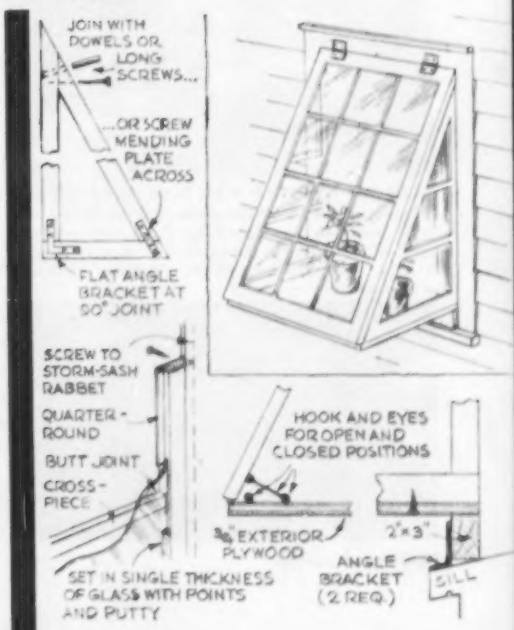
Build a window greenhouse

ITS OWN storm sash can convert any window on the sunny side of a house into a charming little greenhouse.

Rehang the storm sash with two hinges at the top. Fasten a two-by-three to the sill, using angle brackets bent slightly to make the top of the piece level. Screw the shelf to this. Chamfer the bottom of the storm sash.

Build two triangular side sashes from 1¼″-by-2″ stock. Set in plain crosspieces ⅜″ back from the outer face. Nail quarter-round molding between them to form the glass rabbet. Set in a triangular piece of window glass with points and putty.

Fasten these sashes with screws into the storm-sash rabbet and through the shelf. If rain seeps through the hinged joint at the top, tack a strip of copper or tar-paper flashing over it as a hood.



Renew the fireplace lining

TO PATCH BIG CAVITIES, mix smashed firebrick and mortar half and half. Ram this in, then poke it full of holes with a nail to speed drying. If the patch cracks, simply rub mortar into the gaps. Fill vent holes the same way.

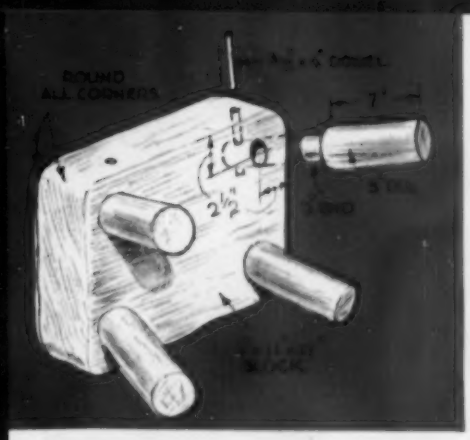
RESET THE ASH TRAP if it's loose. Brush all joint edges clean, butter the under edges of the trap with mortar (as shown in the photo above), and set it back in. Then trowel mortar around it over the surface of the hearth (below).

MAYBE you never look into your fireplace unless there's a blaze in it. But the experts do. One real-estate appraiser, when asked how he went about putting a value on a house, said that he inspected the foundation first, and the fireplace lining next.

Why?

"Because nobody ever keeps up his fireplace," he answered. "The firebrick always need repointing. How much repair work is called for is a tip-off to the age and condition of the whole house."

Even though you may not be planning to have your house appraised, there is good reason for taking a trowel to your fireplace right now. The sooner you fix crumbling firebrick, cracks or gaping joints, the easier it is to do. Otherwise,



Hew a fireside stool

HACK away at a chunk of four-by-twelve wood the way the old-timers used to do if you want a sturdy fireside stool. Lacking such a piece, as is shown in the pictures, you can simulate the effect by gluing three 17″ lengths of four-by-four edge to edge.

Plane the piece smooth and chisel out the top surface to form a concave seat. Rough-round the legs (also four-by-four) with plane and spokeshave. Shoulder one end of each to fit into 2″ holes. Pin the legs in with ¾″ dowels through the sides. Finish with clear shellac.

every fire you build on the hearth keeps hammering away at the lining. Once the clay in the joints crumbles away, the corners of the bricks are exposed to flame and begin to flake and crack. Bit by bit your bricks go out with the ashes.

If you tackle the job in time, all you need is mortar and perhaps a couple of extra firebricks. Be sure to buy what is called air-setting refractory mortar.

This is the stuff that's used for patching locomotive fireboxes and steel-mill soaking pits. Sold wet, ready for use, it has the consistency of very soft putty. A 10- or 15-pound can costs about $2.

As the first step, clean soot off the fireplace surfaces with a stiff brush so that you'll be able to see what's needed. Then rake badly flaked bricks with an old scraper or chisel. Remove the crumbly surface down to solid brick. Make a hook out of coat-hanger wire to scrape out the joints, removing as much mortar as readily crumbles out.

Dilute a little of your new mortar with water to make a thin slurry. Paint the scraped joints and brick areas with this as an undercoat. Let it dry.

Then, using the mortar as it comes from the can, trowel a thin coat over areas you have scraped. With a putty knife, work mortar well into the joints between bricks, including those in the hearth. Rub joints smooth with a rag when the mortar begins to set.

You'll find it's firm in about an hour. But it's best to wait a week before you build your next fire. END

Make a

WHAT better decoration could you mount on the peak of a garage roof than this graceful sports-car weather vane?

On a large sheet of paper (wrapping paper will do) draw a grid of 1″ squares, at least 26 in one direction and 15 in the other. Then follow the drawing on the facing page to lay out the car and wire frame.

Trace the car outline on a piece of ¼″ tempered hardboard, and cut it out with a jigsaw or coping saw. Sand the edges smooth and apply two coats of spar varnish to waterproof it. Fasten two ⅜″ pillow-block bearings to the rough side of the hardboard, using flathead machine screws countersunk on the face side.

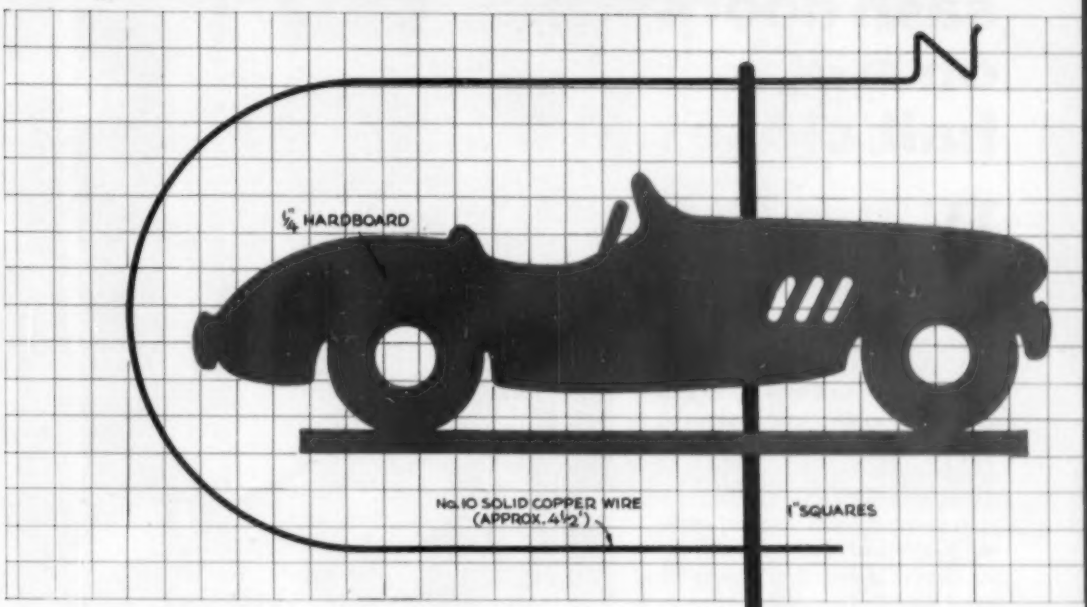
Make the base from a short piece of four-by-four cut to match the roof pitch. Screw a 5″-by-10″ piece of ¾″ stock to the base, first beveling the upper edge so that it can slide under the ridge shingle. Coat these with spar varnish, too.

A floor flange and a length of matching ¾″ pipe form the upright. A 2′ length of ⅜″ drill rod, cotter-pinned in place, acts both as a standard for the pointer frame and a smooth pivot for the bearings. The frame, curved from No. 10 solid copper wire, goes through transverse holes drilled in the drill rod. Don't assemble the wire frame until you have first slid the shaft collar onto the drill

ESTABLISH ROOF PITCH with either a bevel square or, better, two strips of wood bolted together at the ends. Sight along the upright, setting it parallel to a vertical line on a neighboring house, or else plumb it with a small level. Then transfer the angle to a four-by-four and cut along it to make a base block that will hold the assembly vertical.

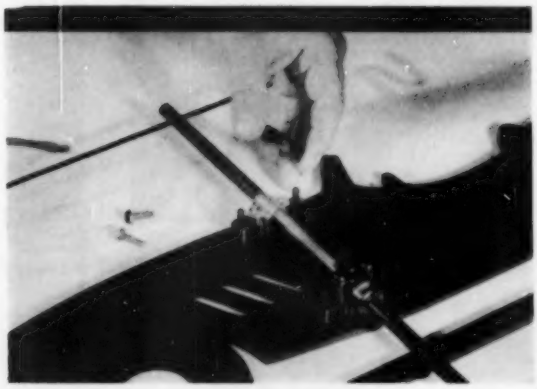
DON'T PAINT the bearing areas on the drill rod (at right). Graphited oil or grease on these and the stop-collar bearing surface will keep the vane free-turning for a season.

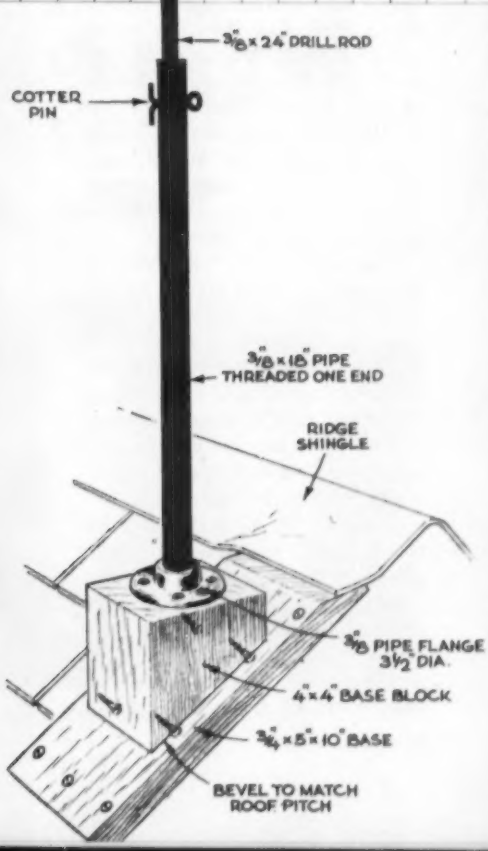
sports-car weather vane



rod. Then add the wire frame and mount the car on its pivot, securing the shaft collar in the place where the car is centered vertically.

Mount the weather vane on the roof with 2″ wood screws over a layer of roofing cement. Adjust the pointer to north by turning the pipe in its flange. Use a level to be sure that the mast is truly vertical. If you oil the bearings occasionally, the car will swing easily.





Put sash doors on a hall closet

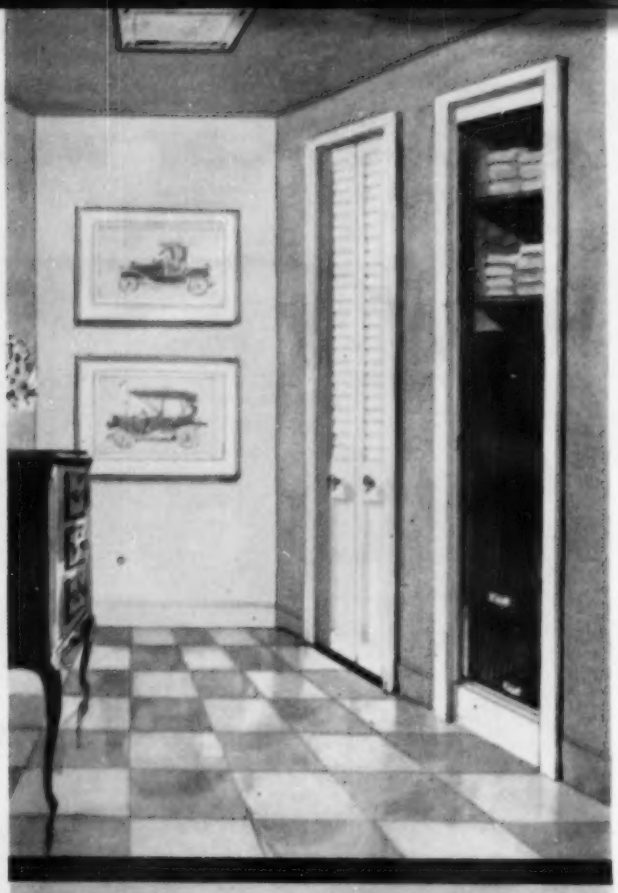
WHEN you open this closet door, it doesn't block the passageway or tangle with other doors. It's in two double-hung sections that slide up and down like a window.

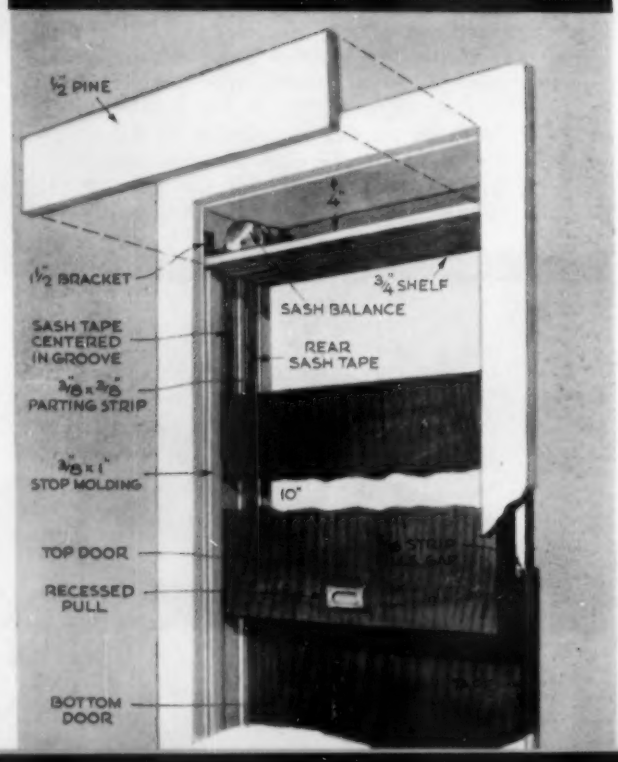
If the original door is the lumber-core flush type, you can saw-cut it in two and make the sash panels from it. Otherwise, use two pieces of 1¼" lumber-core plywood.

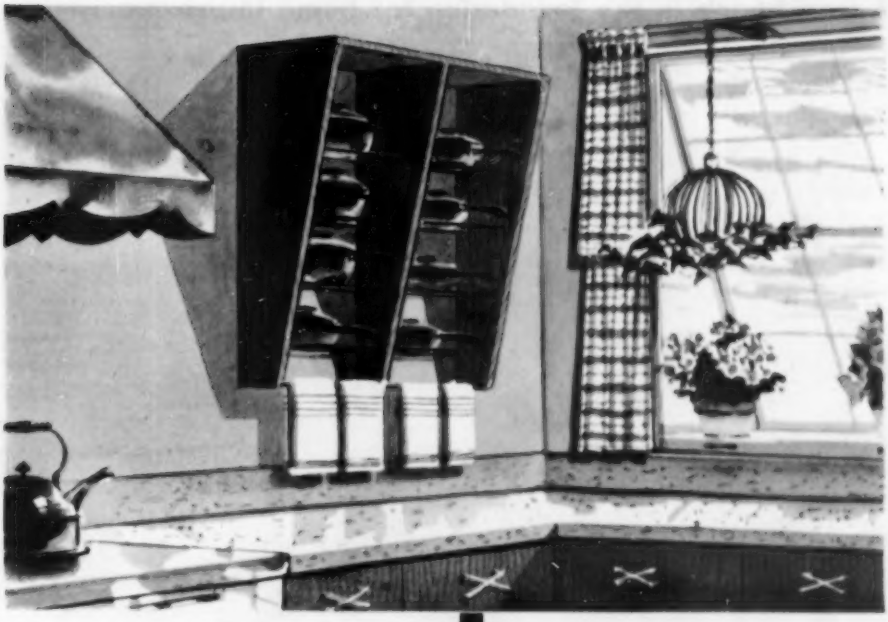
Remove the old hinges, striking plate and door stops from the jambs. Glue thin pieces of wood into the recesses and sand them flush. Cut the door halves so that their combined length is 3" less than the inside height of the frame. Plane the edges to allow not more than ¼" clearance at each side. Weigh each door and measure its travel. Then buy two pairs of spring sash balances to suit.

Cut a piece of 1" shelving to fit across the door frame. Fasten it inside, 4" below the top, with steel angle brackets. Nail a ⅜"-square parting strip down the center of each side frame from the shelf to the floor. Measure ⅝" on each side of the parting strip to center the tapes and balances for the 1¼"-thick doors.

Remove the shelf, cut slots for the balances and screw them in place. Chisel shallow grooves about 10" long in the side edges of both doors and attach the tapes. Nail the outer stops in place, trying the doors as you work to check for binding.







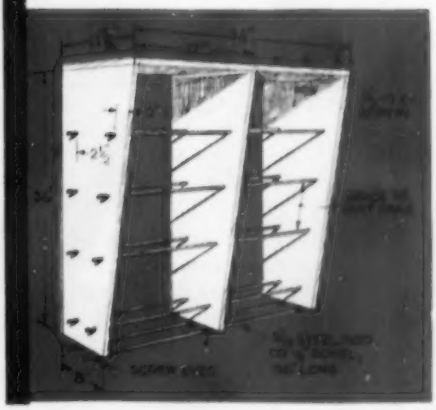
Hang a dust-free pan shelf

DUST won't gather on the stepped-in, spindle shelves of this modern pan holder. Its shadowbox-like hood is designed to show off prize kitchenware handsomely. The bottom rod makes a convenient towel rack and the broad top can be used as a shelf for planter boxes.

Cut the frame members from 1″-by-12″ pine or ¾″ plywood. Clamp the three vertical pieces together and drill holes through to insure rod alignment.

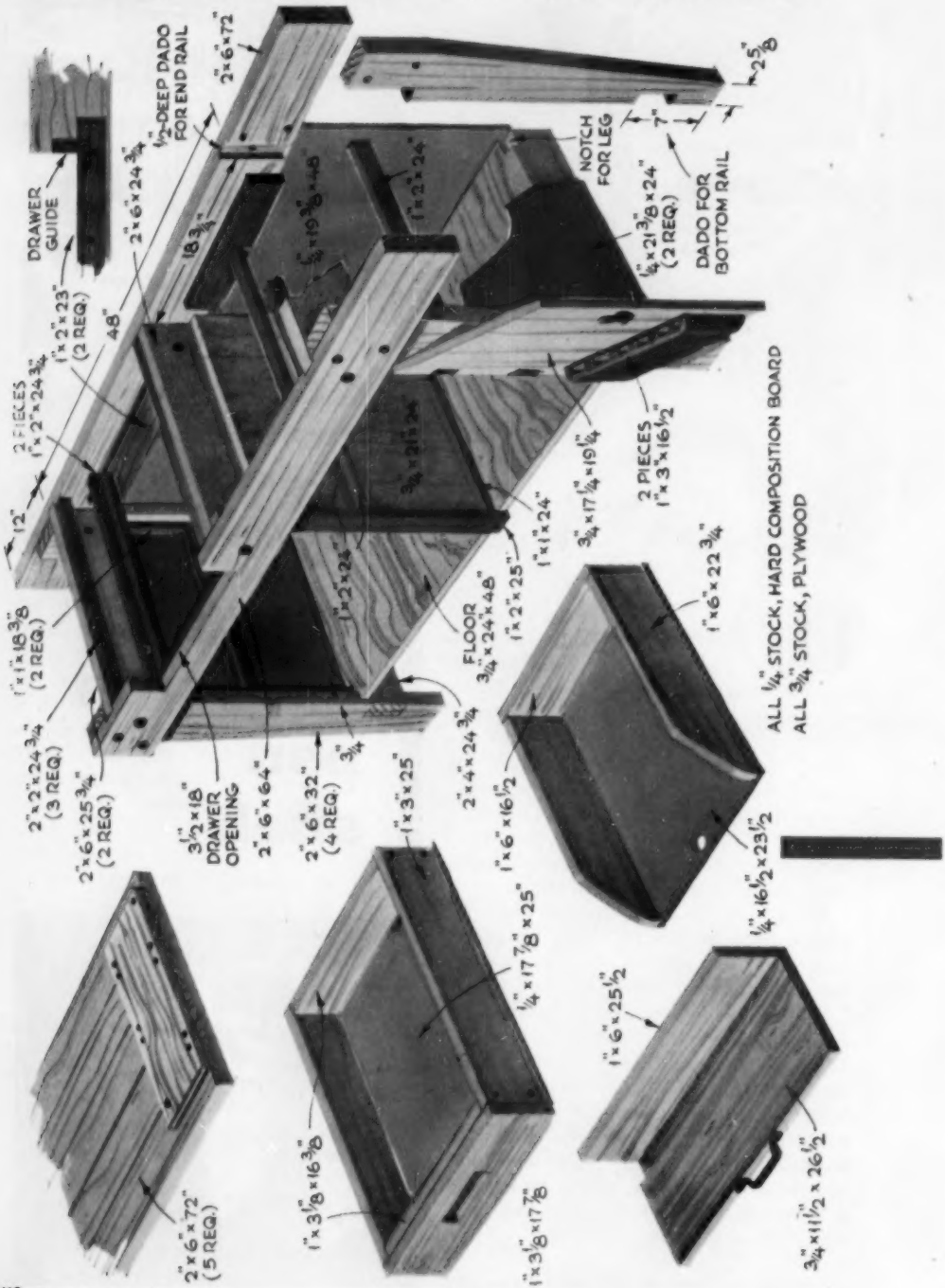
Before attaching the top with glue and brads, force-fit the 36″ rods in place. Use 3/16″ steel if it is available; otherwise ¼″ maple or birch dowels will do.

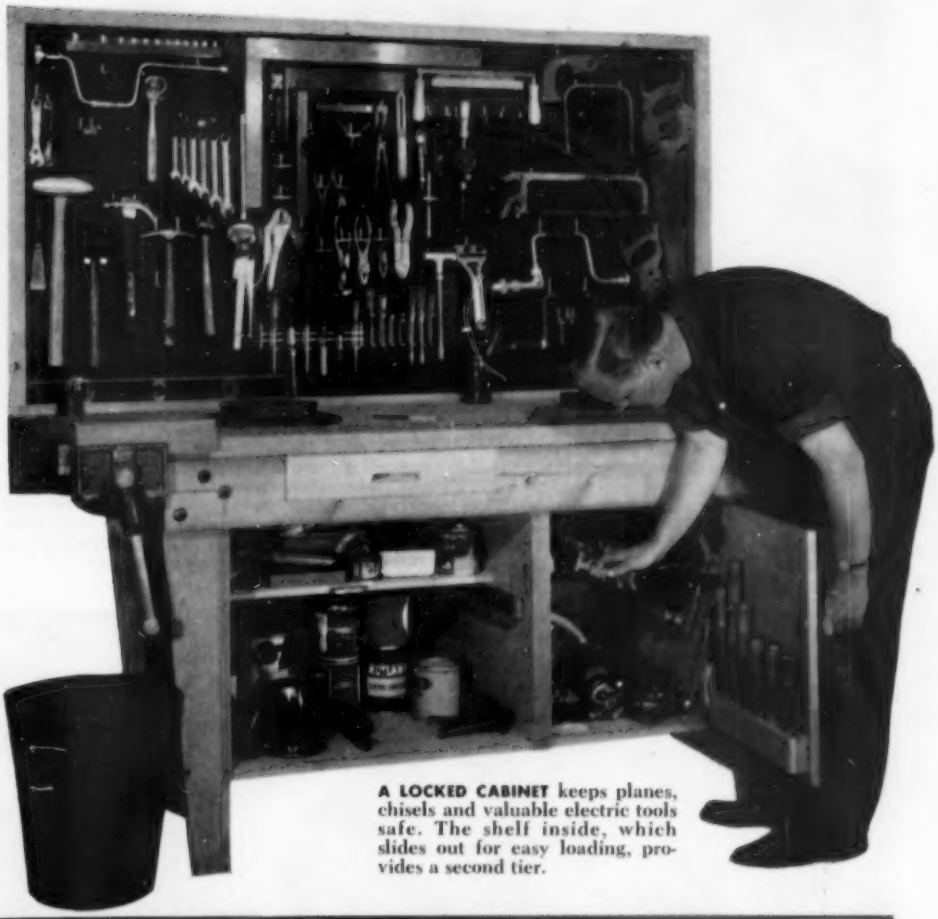
If plywood is used for the frame, use resin sealer (such as Firzite or Rez), to minimize the grain before finishing. You can enamel it in a color to harmonize with the kitchen, using a contrasting color for the rods. If you prefer to give the frame a natural or stained-wood finish, paint the rods flat black. Mount the unit on the wall with angle brackets and expansion screws.



For a workbench that will help you handle these 12 projects, please turn the page

A workbench is the foundation for home improvements





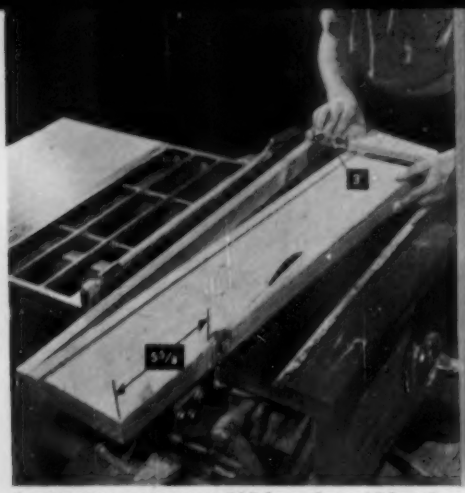
A LOCKED CABINET keeps planes, chisels and valuable electric tools safe. The shelf inside, which slides out for easy loading, provides a second tier.

How to build a good workbench

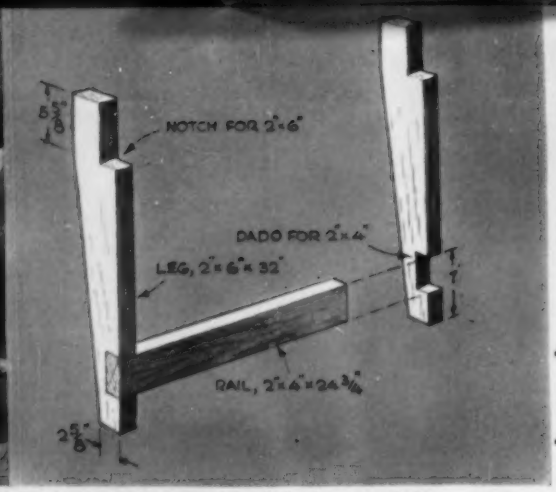
IN THESE do-it-yourself days, a workbench is nearly as essential as the kitchen range. It makes most jobs easier, tricky ones surer. You'll tackle both chores and hobbies with more zest if you have a roomy work top, a husky vise and a handy tool rack. These are all standing invitations to get busy.

Designed and built by PSM staffers Hubert Luckett and Harry Walton, this workbench is first of all solid (a flimsy one is about as satisfactory as a leaky roof). It's big—the top is 28" by 72". The king-sized tool board will hold a big home-shop assortment. Sliding shelves give you full use of both storage sections. A drawer holds small items.

Best of all, it's easy to build of stock lumber and plywood, as shown in step-by-step pictures on the next three pages.



1 CUT THE FOUR LEGS 32" long from 2"-by-6" stock. Legs can be left straight, but a taper looks better. To rip it on a circular saw, make the simple jig above. Nail two straight pieces together at one end; 32" away nail a crosspiece to hold them 3" apart, and nail a stop block under it. Set the saw fence to start ripping 5⅜" from top end of leg.



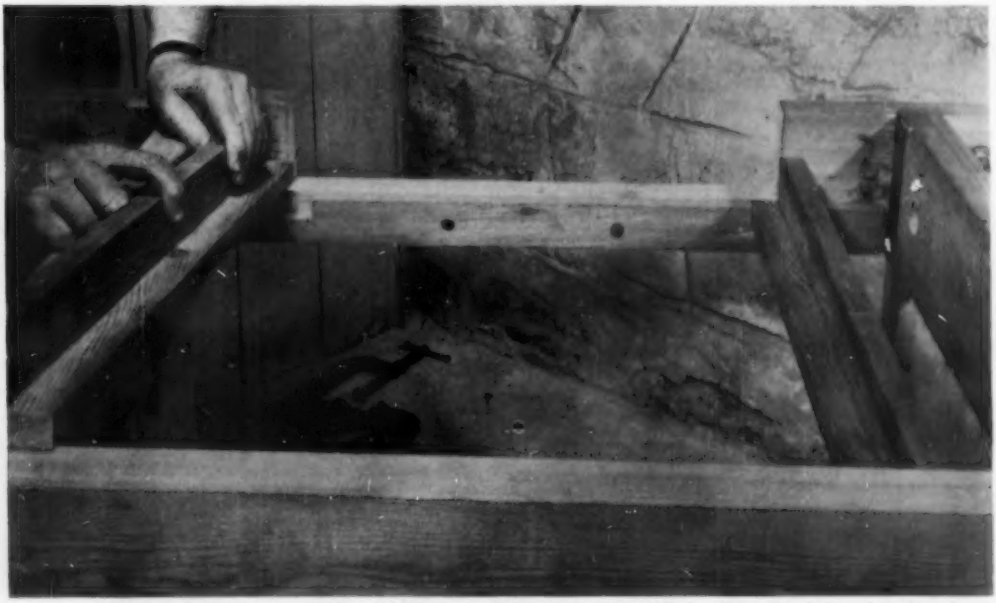
2 NOTCH THE TOP ENDS of the legs for 2"-by-6" rails. Dado the lower ends for 2"-by-4" rails. Use hand saw and chisel, or make successive passes on a circular saw and chisel out narrow waste remaining. Check the width of the 2"-by-4" stock to size dadoes for a close fit. Assemble lower rails and legs with glue and two 3"-14 wood screws in each joint.

5 BENCH NOW STANDS on its own four legs. Keep them clamped to the long rails to drill through for two ½" carriage bolts in each leg. The rounded heads of these sink almost flush and will clear stock held in the vise, while the square shoulders prevent turning as you tighten the nuts. Use washers under the nuts, which tighten against the insides of the legs. If drawer notch has not already been cut in the front rail, better do it now.

6 CUT CENTER RAIL to fit between the long rails and install it with drawbolts. Notch the corners of the 2'-by-4' plywood floor so that its front edge comes ¾" behind the front legs. Fasten it to the lower cross rails with countersunk screws. Screw the post (at rear in above view) to the inside of the front rail and front edge of floor. Fasten cabinet wall to side of center rail and screw it to a cleat that is itself screwed to the floor, as above.

3 CUT TOP CROSS RAILS 1" longer than lower ones. Bore 1¼" hole 4" from each end of them (see drawing on page 116). Set the cross rails into ½"-deep dadoes in long rails. Counterbore these ¼" deep, on center of dado and rail widths, as above. Jig of four pieces nailed swastika-fashion around ½" bit and clamped on rail surface helps drill drawbolt holes true.

4 LONG DRAWBOLT HOLES go through the counterbore into the 1¼" hole in cross rail. Insert 5" stove bolt with washer under head. Put washer and nut on it inside cross hole and tighten the bolt. Clamp the legs in place; then drill through cross rails into legs for 5/16" lag screws, as above. Use washers or strap iron under these lag screws and tighten well.

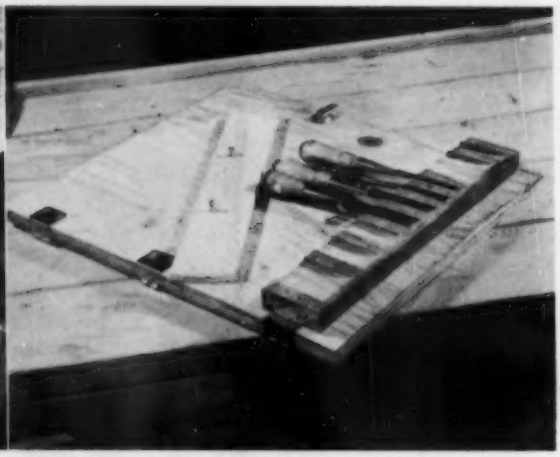


7 MAKE DRAWER GUIDES by joining two pieces together at right angles with wood screws. Notch two cleats to fit the guides, spacing the notches so that the inner faces of the guides will line up with the corners of the drawer opening as shown at right above. Fasten the cleats with screws to the insides of the front and rear rails. The guides themselves need not be fastened, but only dropped into the notches (above left). Inside the cabinet compartment at the right-hand end of the bench, mount similar cleats but with only one center notch facing downward. A one-by-two screwed to these will keep the loaded cabinet drawer from dropping when pulled out. Make two-piece guides for this as for the small drawer. It is best to sacrifice drawer width and space the right-hand guide far enough off the leg to let the drawer clear the cabinet door when this is opened no more than 90°.

8 THE WORKBENCH TOP could be screwed directly to the cross rails, but the screw heads would show, unless deeply set and plugged over. Cleat fastening is easier and leaves the top smooth. Clamp cleats of two-by-two stock 1/16" below the top edge of each cross rail. Drill for five 3"-14 screws, spacing them the width of the top planks (5⅝") apart. Draw the screws up tightly, preferably with a screwdriver bit in a brace as shown.

9 MAKE CLAMPING JIGS, if you haven't bar clamps, to draw the top together. Nail a block to one end of a stout board, put the five top planks on it, lay a wedge (or waste ripped from the leg tapers) against the outer one, and nail a block against the wedge. Use three such jigs. Drive in the wedges to pull the planks close. Then tie them together with ¾" plywood plates, sized to go between the long rails, spaced to fit outside the end rails.

10 LAY THE TOP on the floor with the clamps still on it if possible, and invert the bench frame on it. Drive at least one 3"-14 screw through each of the three cleats into each plank, as above. Fasten vertical cleats inside the legs to screw the end panels to. The rear panel, of ¼" composition board, is screwed directly to the rear legs. In building the two sliding shelves and the drawer, check dimensions against spacing of the guides.



11 SPECIAL PLYWOOD HINGES, with an extra bend on one leaf for screwing to the inner face of the door, give maximum strength. Chisel rack was made by running 1¼" stock over a dado head on the circular saw to form pockets for blades, and mounting a cover. The tool board shown on page 117 is ⅛" perforated panel set into grooves in two-by-two stock, joined with half laps at the corners. Penetrating floor sealer makes a good workbench finish. **END.**

MORE Home-Improvement Features: Starting on Page 242

POPULAR SCIENCE
REG. U. S. PAT. OFF.-Monthly

Out Goes the Brake Pedal

By Devon Francis

In its stead is an automatic power brake, worked by letting up the accelerator.

Inventor Stan

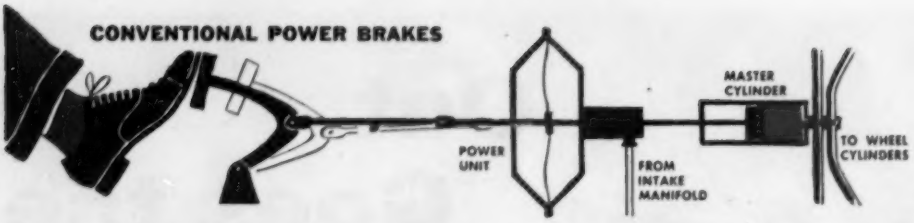
Promoter Bud

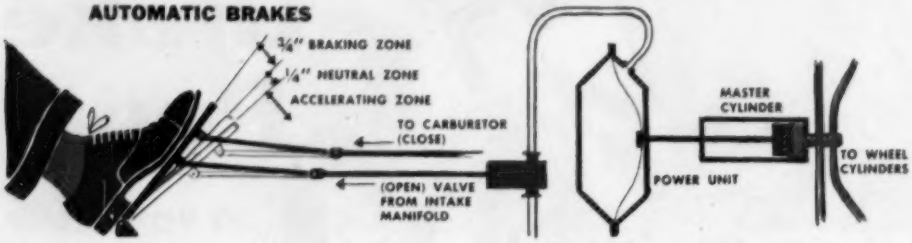
STANLEY RICE HEMPHILL is a man in his middle sixties who has made a good living all his life inventing things, and right now he figures he's about to hit the jackpot with a new one—an automatic brake for automobiles and trucks.

The brake is automatic in that you don't have to press a brake pedal to stop. You just let up a tiny fraction of an inch on the accelerator. Gremlins do the rest.

Essentially, all that this braking system does is to use the accelerator to operate a valve that controls your power braking. The valve takes the place of the brake pedal on your floorboard. When the accelerator is down, the valve is closed. When the accelerator is released, the valve meters vacuum from the intake manifold to the vacuum "can" (diaphragm) that works the master brake cylinder.

Making a car's service brakes automatic is only a part of Stan Hemphill's newest invention. It has a "cruise control" that lets you





SIMPLIFIED DIAGRAMS show how the automatic brake works. (The three different functions are pictured separately for clarity.) Accelerator linkage is proportioned to give a ¼-inch neutral zone. A control valve corrects for variations in the existing manifold vacuum.

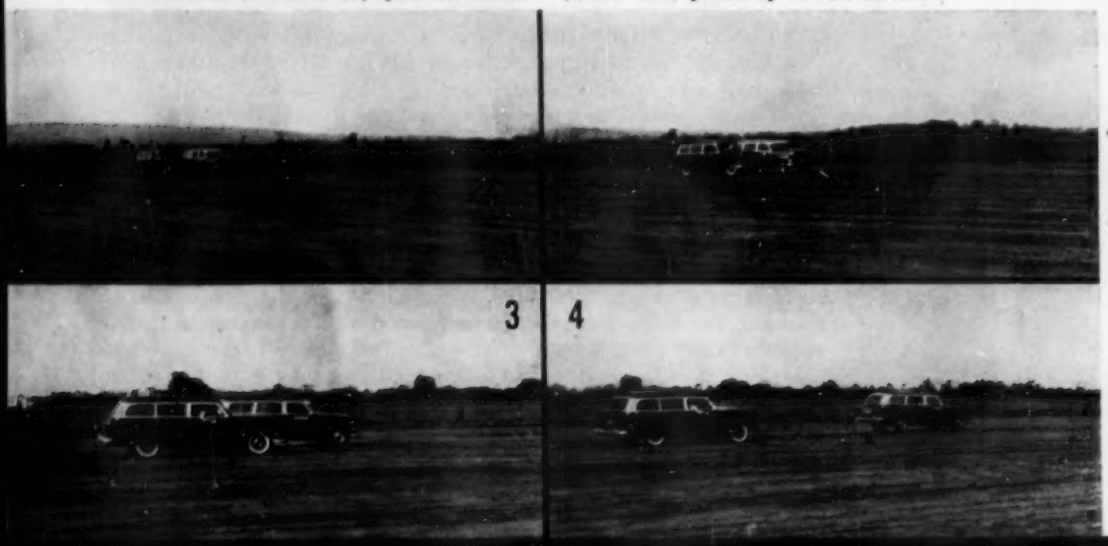
roll along the highway with your accelerator foot on the dash if you wish.

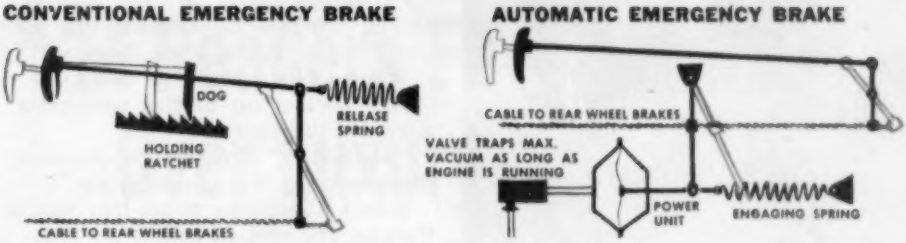
Automatic braking seems to do pretty wonderful things in a panic stop. It readily cuts three-eighths of a second off your reaction time. At 60 m.p.h., that's 33 feet of travel.

From a speed of 50 m.p.h., according to the National Safety Council, it requires 220 feet to come to a panic stop on dry concrete. The Hemphill automatic brake panic-stops a car in 128 feet —and the car doesn't swerve. That's because the engine vacuum is metered precisely through the valve that Hemphill calls the "brain box." The braking effort is "modulated," as the engineers put it.

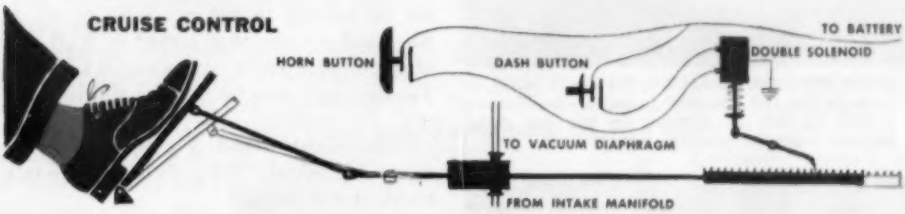
All these things Hemphill's invention

MAXIMUM BRAKING TESTS, run off before PSM's automatic camera, showed consistently shorter stops for the new system. The two cars weighed the same, had identical brake linings. Drivers were switched to cancel any personal factor. Cars were driven side by side at various speeds; blank cartridges were fired without warning to signal the start of a panic stop. In the sequence below, at 50 m.p.h., the automatic-brake car (nearer one) pulled up 51 feet shorter.





EMERGENCY BRAKES of automatic system are held *off* by manifold vacuum, as a train's brakes are held off by air pressure. If engine stalls, brakes go on when vacuum is gone.



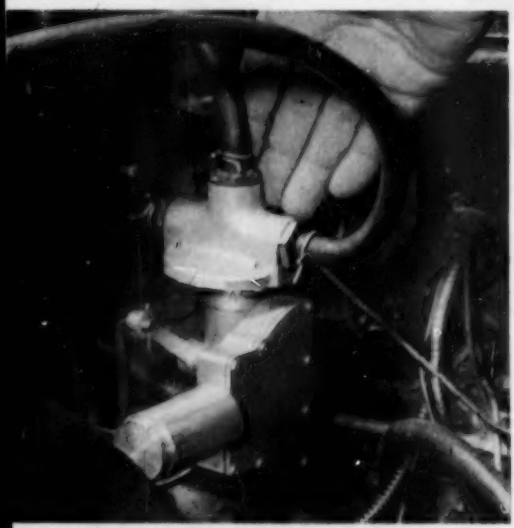
Cruise control, separate from braking system, locks accelerator at any selected road speed.

will do. I know. I drove a couple of cars equipped with it. But soon I began to wonder, and questions began nagging.

- What's the educational problem in getting drivers to unlearn an old braking habit and adopt a new one?
- Sure, I can, but what about my wife?
- Isn't there danger if the engine fails?
- Doesn't this thing put a dangerous limitation on my maximum braking effort?
- Doesn't that fraction of an inch travel on the gas pedal require a pretty sensitive toe to gauge braking effort?
- Suppose I'm in cruise control and accidentally disengage it, putting the brakes on full—won't the fellow behind smack me in the rear?
- What happens if I thoughtlessly lift

REDUCED DRIVER-REACTION TIME is one reason why the new brake delivered this difference in one 50-m.p.h. panic stop. Your foot need only come up, not also move over and press down.

GONE WITH THE BUFFALO is the brake pedal, at least in this test car. But in initial installations it will be left in. Letting up the gas pedal beyond a neutral position stops the car.



THIS "BRAIN BOX" takes orders from the gas-pedal position, and meters vacuum to the power-brake mechanism. On a panic stop, it holds hydraulic pressure just shy of locking wheels.

my accelerator foot to scratch an itch? • Doesn't automatic braking chew up brake linings?

Most of these questions dissolve in the driving. Some yield to reasoned evaluation. One or two remain to nag.

Stan Hemphill likes to tell about the woman in Los Angeles who came up for her driver's license test at the wheel of an automatic-brake car. The examiner, sliding into the right front seat, suddenly began staring at the floorboard.

"Where's the brake?" he asked.

"It's hooked up to the accelerator," answered the woman.

"No, thanks," remarked the examiner, disembarking, "this is not for me."

It took 15 minutes to get him back in the car. The woman passed her test.

"Where," asked the examiner contritely, "can I get this thing for my car?"

Had to convince wife. I had to do a lot of talking to get my wife to try it. She said no, she was afraid of it. It was strange. She knew she wouldn't like it. Finally, and reluctantly, she slid into the seat and fired up.

Ten minutes and a couple of miles later she asked, "Why didn't somebody think of this before?"

I was skeptical, too, as I started on a trip to an abandoned airport strip near the upstate town of Dunkirk, N. Y., for the express purpose of wringing out this brake system.

My repeated questions to Oliver Hemphill, Stanley's nephew and president of the research and manufacturing company that developed the device, always started with, "But what if . . ." After an hour, I stopped asking.

The problem in teaching drivers to use the brake is inconsequential. I was at ease with it in 10 minutes. Oliver Hemphill said women learn quicker. Men are plagued with a horrifying image of what's going on in the system.

As for my other questions:

If the engine fails, you still have maximum service-braking effort through engine vacuum *so long as you don't take the car out of gear.* Take the car out of gear, and the emergency brakes take hold automatically.

Automatic braking actually boosts a person's maximum braking effort; vacuum does more than leg muscles can.

The fraction of an inch travel on the accelerator pedal is a delight to the toe. It learns fast.

If cruise control is accidentally disen-

[*Continued on page 292*]

PSM Readers Favor Safety Over Luxury in New Cars

IN THE June issue of POPULAR SCIENCE MONTHLY, Col. Don S. Wenger, an Air Force doctor, wrote of today's automobiles:

"The most commonly heard arguments against the introduction of certain safety features are, first, that they cost too much and the public wouldn't buy them; and, second, that there is no real demand for cars specifically designed for safety."

If the results of the readers' questionnaire printed in the same issue are any criterion of the public's attitude, those arguments are, as Col. Wenger suspected, pure bosh.

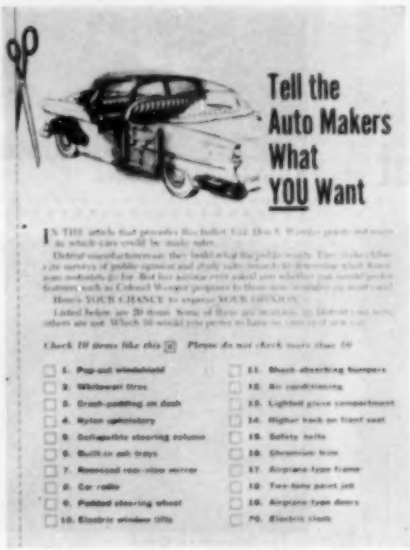
The votes are recorded on the next two pages.

The questionnaire —reproduced here— listed 20 automobile accessories or "extras" and asked readers to vote for "the 10 you would prefer to have on your next car." There were 10 items which are existing luxury or comfort features; 10 were safety improvements that have been tried on a few cars or were proposed by Col. Wenger.

The mail poured in—more than 5,000 ballots. And safety won by a landslide.

In eloquent testimony to the solid good sense of the motoring public, the biggest votes were for those items designed to prevent the injuries most often suffered by the 30,000 American motorists who are killed, and the 1,700,000 who are injured, each year.

Crash padding on the dash drew the greatest number of votes. Shock-absorbing bumpers came next, followed in order by safety belts, pop-out windshields and collapsible steering columns.



This was the ballot.

Cornell University's crash-injury research program points out that the collision, the sudden stop, the sickening pitch forward onto the steering column and dash, and into the windshield, account for most of the deaths and injuries suffered by people *inside* the automobiles involved in accidents.

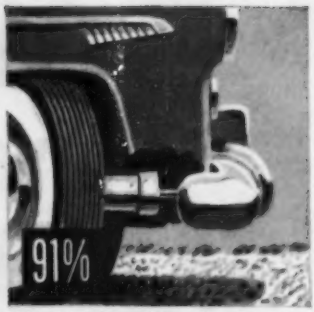
In no instance did a luxury or comfort item in PSM's questionnaire register a vote near that for any one of the safety features. The biggest "write-in vote" was for roll-over bars, mentioned in Col. Wenger's article but not included on the ballot.

Detroit, too, is becoming safety-conscious. Seat belts now are optional equipment. One manufacturer already has tried a pop-out windshield. Crash-padded dashes are becoming common. The major firms have instituted their own crash-design programs, and results of that research will be reflected in 1956 cars.

To see how they voted, please turn the page

SAFETY FEATURES

Crash padding on dash



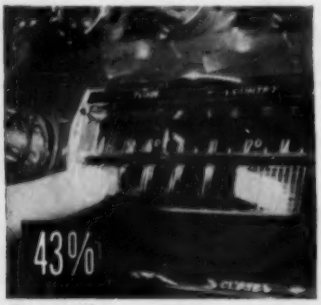
Shock-absorbing bumpers

Airplane-type doors

Recessed rear-view mirror

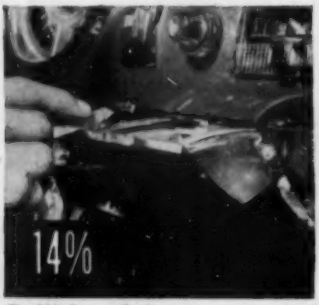
How readers voted in PSM poll asking: What features would you prefer in your next car?

LUXURY ITEMS



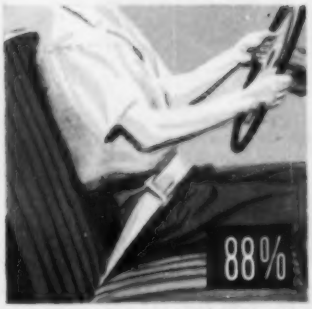
Car radio

Air conditioning

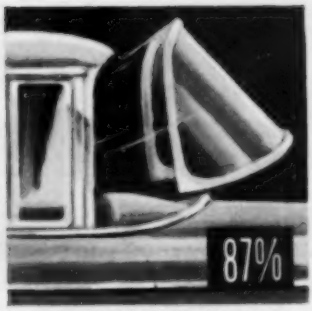


Built-in ash trays

Electric clock

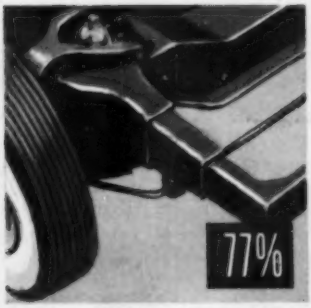


Safety belts



Pop-out windshield

Collapsible steering column



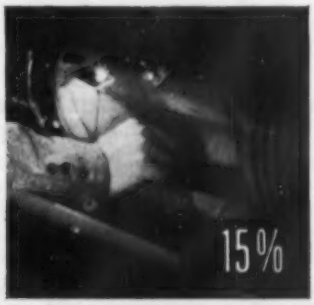
Airplane-type frame

Higher back on front seat

Padded steering wheel

Nylon upholstery

Two-tone paint job



Lighted glove compartment

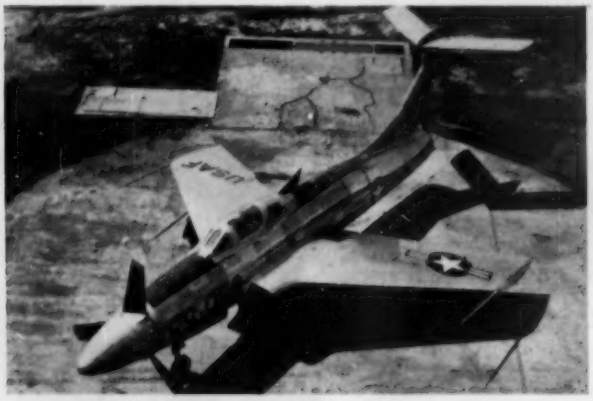
Electric window lifts

Chromium trim

Whitewall tires

Twin Jets at Rear of Fuselage Power France's Newest Airliner

CLEAN wing contours and a larger flap area, made possible by moving the jet engines to the rear, are expected to give the 90-seat Caravelle greater lift and stability. This first French-built jet transport, now being tested, is powered by two Rolls-Royce engines, can carry a 10-ton payload, and cruise at 475 m.p.h.



Turboprop Fighter Readies for Tryout

BY PUTTING this experimental XF-84H fighter through its paces the Air Force expects to learn more about propeller planes that fly faster than sound. The Republic-built craft is the first fighter to use afterburners, giving jet thrust at the tailpipe, to augment its propellers. Tests at Edwards Air Force Base, Calif., may prove the feasibility of turboprop fighters.

Vacuum Sucks Out Metal Dents

ORDINARY metal fillers don't match the color of bare aluminum, so Glenn Martin engineers had to find another way to make unpainted wing tanks air-smooth. They now use a powerful vacuum pump and tight-fitting gaskets to pull out small dents.

Patterns Speed Plane Repairs

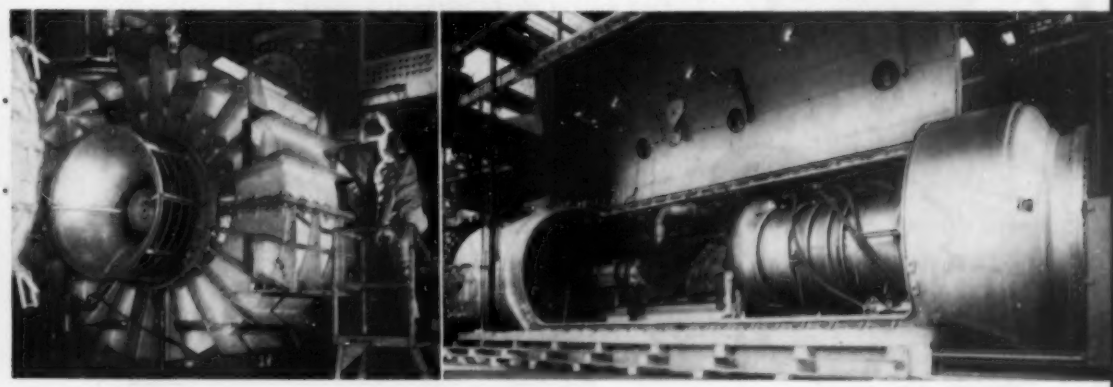
THIS cabinet contains full-size parts drawings for McDonnell Aircraft's F-101 Voodoo—plus the equipment needed to transfer any drawing to metal. With the "Voodoo-It-Yourself" kit, mechanics can make replacement parts accurately and fast.

An Outboard Motor Lifts and Flies This One-Man Copter

AERIAL hedgehopping by combat troops may have been brought closer by development of Goodyear Aircraft's lightweight, all-frame egg beater. Rotors of the GA-400R are turned by a standard water-cooled, two-cycle outboard. The "Gizmo" can hover, fly in formation, turn sharply, and scoot forward at speeds up to 70 m.p.h.

Giant Ramjet Test Stand to Check Out New Supersonic Engines

RAMJET engines that can move planes at five times the speed of sound are being studied in a huge new test stand built by Curtiss-Wright. Ramjets use oxygen scooped in during high-speed flight to burn fuel faster. To simulate air flow, the compressor at the left, driven by three electric motors totaling 17,000 hp., pumps air into the 99-foot, water-jacketed test stand at right. Power plants in the cylinder can be souped up to top output under conditions simulating high-speed, high-altitude flight.



How Near Is

Satellites will help explain mysteries up where the atmosphere is 10 billion

By Alden P. Armagnac

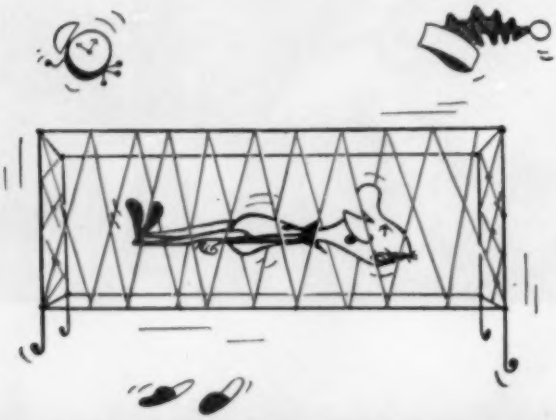
SKETCHES FROM WALT DISNEY'S "MAN IN SPACE"

WHEN American pioneers launch a basketball-sized artificial moon, in the latter part of '57 or in '58, the first step will have been taken toward travel to other worlds. U. S. Earth Satellite No. 1 and others to follow, coursing in an orbit 200 to 300 miles above the earth, will serve as space-flight laboratories. Carrying "telemetering" equipment to report instrument readings automatically by radio, they can supply the information that must be learned before we can fly to the moon and beyond.

The spectacular project announced by President Eisenhower calls for boosting small unmanned satellites into the vacuumlike region of true space. Borne aloft by a giant rocket, probably of three stages, each tiny moon will be hurled whizzing around the earth at the fantastic speed of 18,000 miles an hour. Visible in the twilight sky with binoculars and telescopes, it will circle the world for days—or weeks, with luck. Then, gradually braked by an atmosphere 10 billion times as rarefied as the air we breathe, it will fall back toward earth. On re-entering the denser part of the earth's atmosphere, it will become a flaming meteor and vanish in vapor.

Observations that it has transmitted, meanwhile, may tell spacemen some of the things they want most to know before venturing into space themselves:

Can we get along without gravity? Well-known to space-flight planners are such novel consequences of



Space Travel?

of weightlessness and radiation

times thinner than the air we breathe.

weightlessness as the people and furniture pictured floating in mid-air, in accompanying cartoons from the Walt Disney TV production, "Man in Space." More mysterious is how "zero gravity" may affect the human body's functioning.

For up to 30 seconds, pilots have flown planes along a curved trajectory simulating absence of gravity, without ill effects. And photos of mice and monkeys carried in free-falling rockets reveal no physical derangements. But experiments to date have been brief, and longer ones are needed to tell whether prolonged weightlessness during an interplanetary flight might be harmful.

"In an animal capsule carried by a satellite, this problem could be more thoroughly studied," says Dr. Hermann J. Schaefer of the U. S. Naval School of Aviation Medicine. "Success would not necessarily depend on recovery of the animals. A few telemetering channels reserved for relaying breath and pulse frequencies would provide interesting information. Telemetering of the locomotion of the animals could also be valuable."

In designing a spaceship itself, weightlessness raises special problems, and satellite builders will have them too. On earth, bubbles in a gassing battery cause no trouble because they rise in the liquid and pass off. Without gravity the bubbles will stay in the electrolyte, making it foam and fizz like soda water. In solving this one, the satellite men will help spaceship planners.

Will meteors imperil space voyagers? They may

[*Continued on page 296*]

Turn the page to see how they'll track satellites

This huge new radar will keep in touch with the moon—and possibly with the planets.

How Radar Will Watch Satellite

SUPPOSE you were asked to referee a sandlot basketball game in Boston from a seat atop the Empire State Building in New York. Impossible? That's what scientists will do to observe the man-made satellites being launched in 1957-58.

The "birds" are basketball-size. They'll be 200 to 300 miles away.

Actually it's quite simple to see so far with radar. The long and delicate finger of electronics can reach greater distances to find even smaller things.

The size is important. A small object—with dimensions close to the length of a radar wave—is "tuned" to the wave striking it and bounces a great deal of the wave's energy back. It's the same thing that happens when you strike a musical note and a nearby water glass vibrates the note back at you. Thus small things are easy to "see" with radar—seagulls and geese, for example, often cause false warnings on our coast-defense radar.

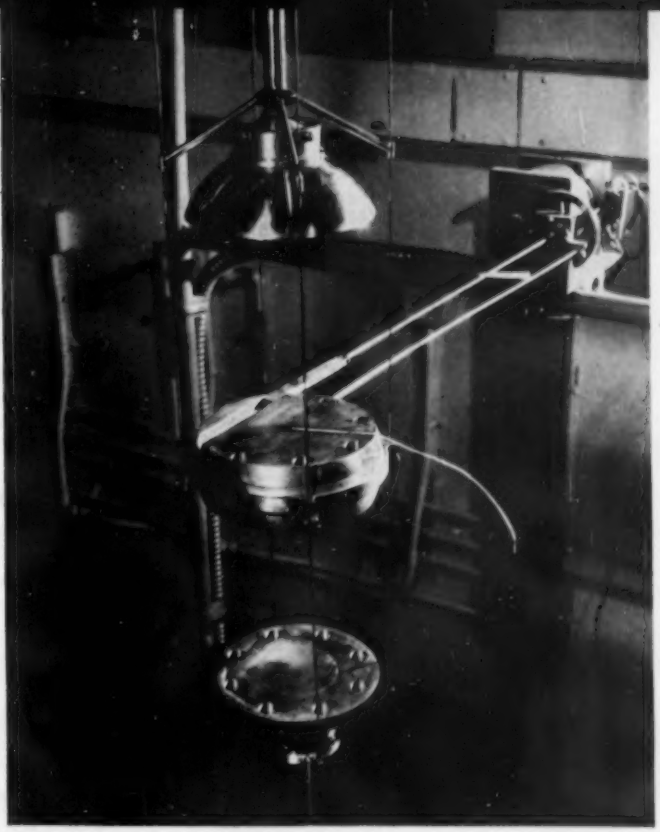
The bird-watchers might use equipment like the Signal Corps' new moon-tracking radar, which can keep the moon under continuous observation and could probably contact Venus and Mars.

The new moon radar, called Diana, is the biggest of its type yet built. It pinpoints the moon with a stream of high-powered radar pulses, averaging an output of 50,000 watts and using up enough electricity to light a city. A small electrical brain keeps this searchlight trained on the moon the way an antiaircraft gun is kept aimed at an enemy plane.

Scientists at Evans Signal Laboratory are anxious to learn how the atmosphere and space affect very short radio waves. They use the moon as a gigantic mirror to reflect their radio waves back to earth. This permits them to study waves that have traveled nearly half a million miles. Even longer paths could be secured by using a planet as a mirror.

Does Secret A-Bomb Look Like This?

NEAREST thing to a picture of an A-bomb is this view of a new remote-controlled "critical assembly," nicknamed Jezebel, at the Los Alamos Scientific Laboratory. Simulating the way an A-bomb is exploded, it brings together three parts of a plutonium-metal sphere. But in this case the sphere just lacks critical size, until inserting a tiny plutonium bar starts a controllable chain reaction. Watched by television, the ticklish experiment is performed from a safe quarter-mile distance.



New Movie System Surrounds Viewer with Full-Circle Picture

WITH 11 synchronized cameras on a circular mount (above), movie men are taking full-circle shots for projection on an eight-foot-high, 360-degree screen. Viewers are seated on an island with the screen all around them. The Walt Disney Studio has already filmed the Grand Canyon, Monument Valley and Balboa Bay in Circarama.

Test House Makes Own Weather

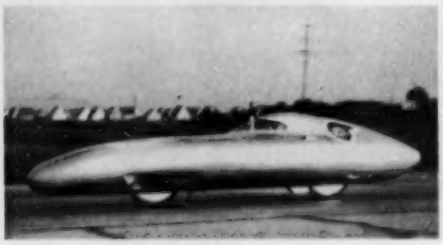
A MODEL house and a maze of circuits helps GE engineers study heating problems. Electrical impulses simulate high winds, heat waves or sub-zero temperatures.

Stars Wink in 10-Foot Heaven

THIS baby planetarium has a power-driven projector that studs a dome 10 feet across with 300 stars. It's sold by Harmonic Reed Corp., Rosemont, Pa.

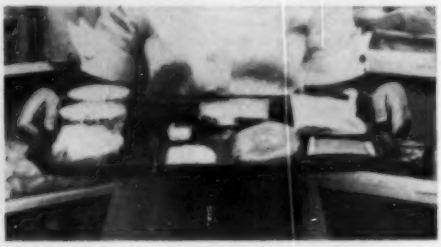
Flat on His Back at 135 M.P.H.

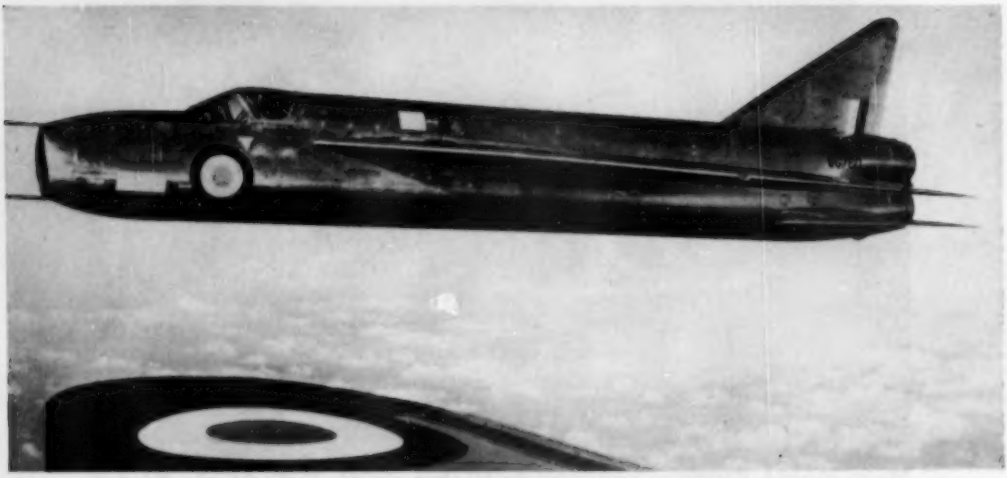
WITH this "flying stretcher"—you drive it lying on your back—German racer Gustav Baumm has hit 135.4 m.p.h. The aluminum shell covers a 125-cc. motorcycle.



Army "Freezes" with Atom Rays

HERE'S a "hot" meal. The Army is testing food shot with atomic rays to preserve it without refrigeration. The irradiating process kills decay-causing bacteria.





Supersonic Jet Is Readied to Rout Invaders Over British Isles

FIRST British plane to hit supersonic speeds in level flight is this P-1, now undergoing tests by the RAF. Dual power plants without afterburners booted the wasplike jet past the barrier. It's a long-range interceptor designed for defense.

Steel-and-Lead Caldron Tames Research Atoms

THIS five-ton "pig" being hoisted out of a water pit at Brookhaven National Laboratory (right) was built as a shipping container for industry's hottest research tool. Four one-pound slabs of cobalt 60—like the one dangling from the hook—were shipped in this "pig" to the B. F. Goodrich Co. The single shipment gives off more radiation than the total world supply of radium.

▶▶▶Better insulators, made by treating plastics with rays from atomic wastes, now permit electric cables to carry safely twice as much current as they could before, British scientists report.

Monorail Gives California Kids an Aerial Ride—in a Circle

THIS overhead-rail speed wagon doesn't go anywhere, but it gets there fast. Built by Ray Maker as a gate attraction for a Santa Clara, Calif., drive-in theater, this kids' monorail travels around a 210-foot circular track, a few feet above the ground.

Ready with A-bombs to answer an alarm anywhere, this outfit is

Our Flying

CAPT. BOB MAXWELL, TAC fighter-bomber pilot, gets the word that his squadron has been alerted.

AFTER PACKING A BAG with uniform change and toothbrush, there is time for a brief family good-by.

A PHYSICAL CHECK at the base hospital is followed by a steak dinner and six hours' sleep.

READY TO GO. He may have to sit squeezed in his Thunderstreak cockpit for more than 10 hours.

WITH FINGER and thumb cocked, four-star general Otto P. Weyland, commander of TAC, points at a spinning globe, indicating that his nuclear-armed, mobile units are ready to strike anywhere in the world.

Emergency Squad

By Herbert O. Johansen, with photos by W. W. Morris

AT LANGLEY AIR FORCE BASE in Virginia, the Tactical Air Command recently completed a month of "hot" exercises. The flight line was a restricted no-man's land to all but participating military personnel—guarded by armed Air Police.

What made the maneuvers "hot," the Air Force has not revealed. But it is a good guess that the pilots of the F-84 Thunderstreak fighter-bombers and the B-57 twin-jet light bombers were getting the feel of new weapons—practicing for atomic tactical warfare.

It has been announced that all the tactical combat planes now have

A field-hospital unit fits easily in a Globemaster.

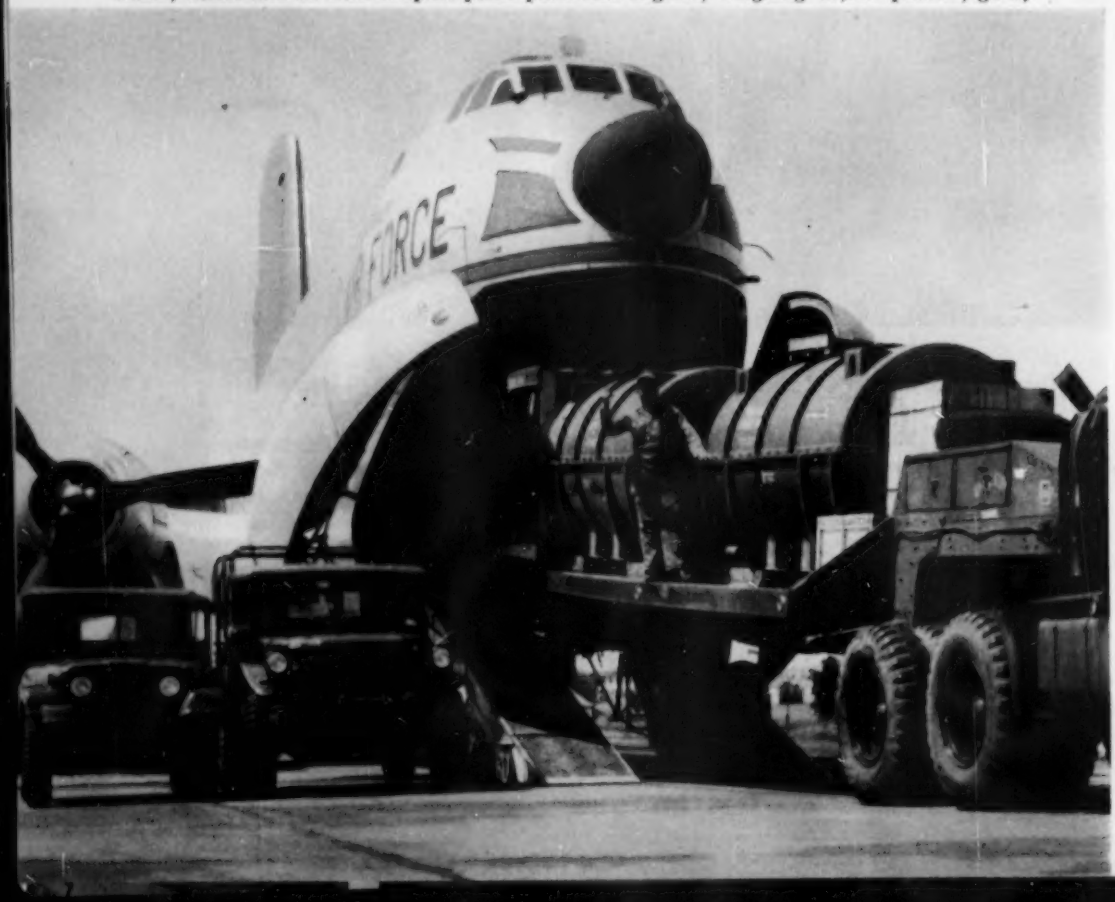
TAC communications and radar

"nuclear capability"—ability to carry and deliver weapons that would give a single plane the striking power of 100,000 World War II B-17 Flying Fortresses.

This atomic capability has created a new kind of tactical air weapon—mobile strike forces, *based in the United States,* that could go immediately to stamp out a little "brush-fire" war that broke out in an isolated area anywhere in the world.

If the Strategic Air Command, with

Truck, trailer and its load of spare plane parts and engines, weighing 40,000 pounds, go by



centers are set to travel by air. **Big helicopter is eased up the loading ramp of a C-124.**

the big bomb and long-range intercontinental bombers, never fights, but by its very being serves as a threat to discourage an enemy from starting an all-out atomic war—its mission is successful.

SAC's little brother, the Tactical Air Command, believes that in these "small packages with a big bang" it has a weapon that will do a similar preventive job against little periphery wars that otherwise might get a head start and spread to ignite the fuse of devastating global conflict.

air, making flights of more than 4,000 miles.

When I asked Gen. O. P. Weyland, chief of TAC, where on earth his new mobile air units could strike, the general walked over to a globe of the world, spun it, and pointed a finger at the blurred map. That was his answer: anywhere.

Asked how fast they could get under way, the general shrugged his shoulders and said that within a matter of a few hours from the red alert would be "no sweat." He was talking not just about his combat planes, but about the big, complex organization that makes up such a fighting unit.

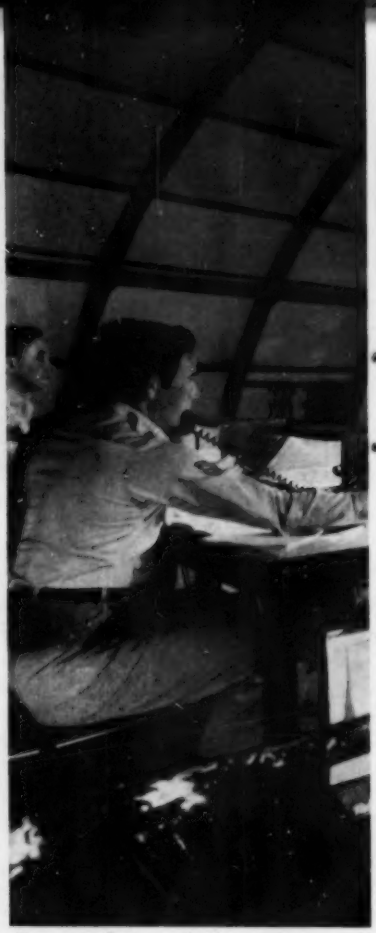
TAC loads up with ground crews, mountains of spare parts, trucks, communications, search radar, spare engines, helicopters, a hospital, administrative personnel and, if necessary, food, tent housing, bombs, rockets, jet fuel—everything to make it self-sustaining for 30 days should the situation call for it. The B-61 Matador pilotless bomber (guided missile), its launcher, crew and atomic load are ready to go along.

The aerial freight cars to carry this tremendous tonnage are TAC's fleet of huge C-124 Globemasters, the Air Force's

TAC will get fast, new C-130 Hercules turboprop transport.

B-57 twin-jet light bomber can outmaneuver fastest fighters.

Designed for TAC is this new B-66, a jet tactical light bomber.



Command control, the nerve

SELF-STARTER FOR THE B-57 is a package of black powder. Placed in the engine nose, it is exploded electrically, producing enough pressure to spin the engine with the smoke effect seen above. F-84 Thunderstreaks have compressed-air bottles to start their engines.

center of a mobile strike force, can be folded up and loaded in a Globemaster cargo plane.

largest operational cargo planes. Through their mobile maws each one can gulp more than 40,000 pounds of man, materiel and machines for a flight of more than 4,000 miles.

TAC strike forces are built around mobility. It begins with the combat planes—fighter-bombers and light bombers. The F-84F Thunderstreak can deliver its load 700 miles into enemy territory from a front-line airstrip. But it cannot span oceans and continents on one filling of its tanks. The Super Hog, as the plane has been lovingly dubbed by its pilots, gets thirsty. Every couple of thousand miles it wants a drink.

In-flight refueling. Aerial tankers solved this mobility problem. For the job TAC is using KB-29s, converted Superfortress bombers. These lumbering, propellered heavyweights would be the first to take off when the "whistle blew," so that they could reach predetermined refueling points by the time the faster jets got there. And because the KB-29 is not fast enough, the jets have to slow to almost a stall while they drink.

There are faster tanker planes, the KB-50s, but SAC, with a higher priority, has them now and is scheduled to receive the first of the new, fast Boeing jet Stratotankers. TAC is looking toward delivery of KB-50s. Also there is talk of modifying the fast new C-130 Hercules, a four-engine turboprop cargo plane, for use as a tactical refueling tanker.

Probe and drogue is in the works for

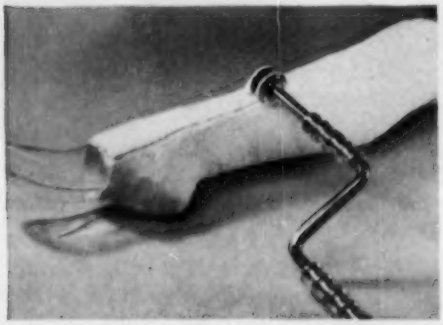
[*Continued on page 304*]

Tractor 'Mud'dles Through

CALLED the world's most powerful tractor, this road hauler is shown oozing through a mud flat at a French army camp. The 25-ton, eight-wheel Berliet T-12 has a 12-cylinder, 450-hp. engine. It can pull a 100-ton pay load at high speed and buck obstacles that would stop most trucks.

De Luxe Bus Pampers Riders

THIS German bus, in service between Munich and Berlin, carries refrigerator, coffee maker, bar and a stewardess to serve sandwiches and hot or cold drinks. It also boasts such comforts as a washroom, wide-vision windows, and individual reading lights and radio speakers.

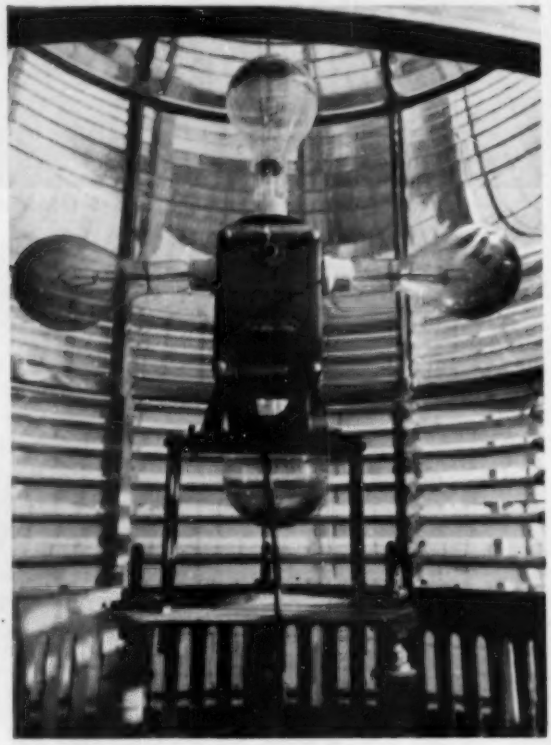


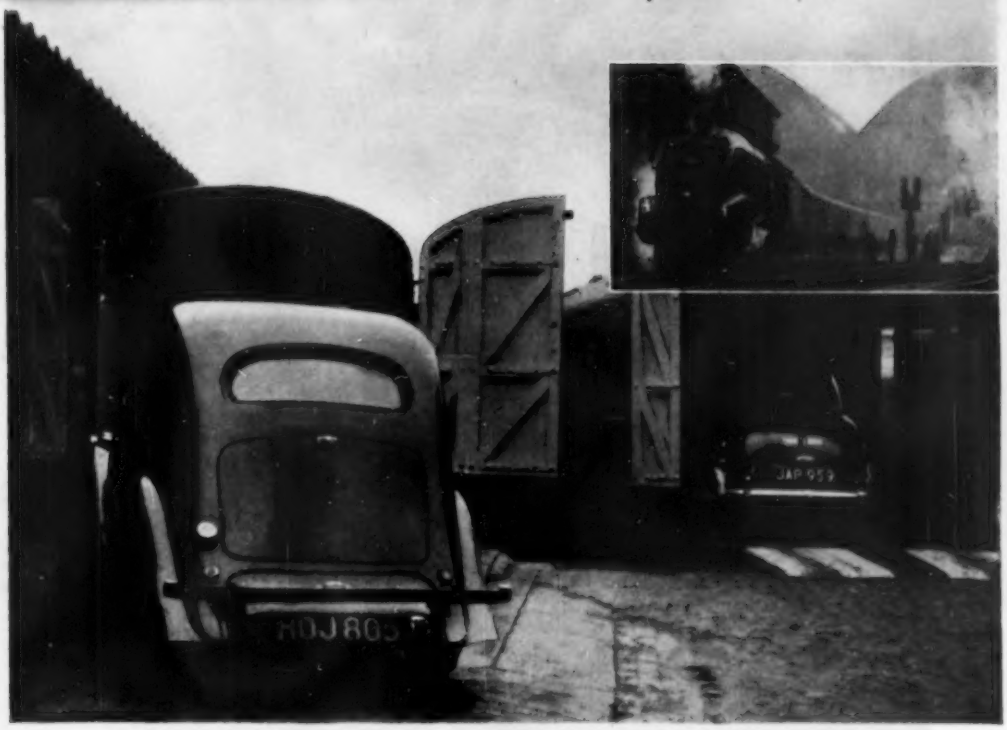
Wire Reel Unzips Plaster Cast

WITH this invention, physicians need only turn a crank to strip the plaster cast off a patient's leg. Wires, embedded in the cast when it's put on, crack the plaster when they're reeled in. Rob. Hoppe, Solingen-Hoehscheid, West Germany, makes it.

Bulb Changer Keeps a Glow On

NO ONE has to change bulbs in the Sand Island Lighthouse at Mobile, Ala. When one of the 1,000-watt bulbs fails, the Wallace & Tiernan square turret automatically revolves to bring a new bulb into position. Once a month, Coast Guardsmen come around to replace burned-out bulbs.





Scotland-Bound Motorists Sleep as Train Does the Work

LONDON motorists, Scotland bound, can have their cake and eat it, too—or at least, take their cars with them and get their sleep at the same time. Special trains (inset), composed of car "vans" and sleepers, have been fitted up by British Railways to carry John Bull and his car on the 450-mile trip to Perth, Scotland. By motor, over winding narrow roads, the trip customarily takes two days. By train, it's a short overnight haul—10 hours. And come morning, mon, everybody's ready to go.

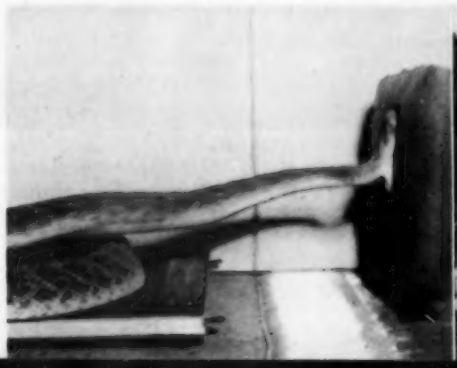
Diamondback Rattler Strikes—and Takes His Own Picture

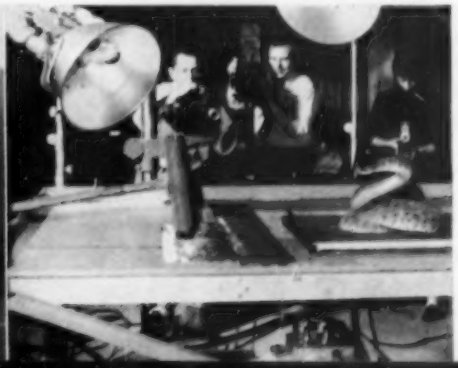
THE N. Y. Zoological Society filmed the first super-slow-motion record of a rattlesnake's strike by letting a diamondback snap his own picture.

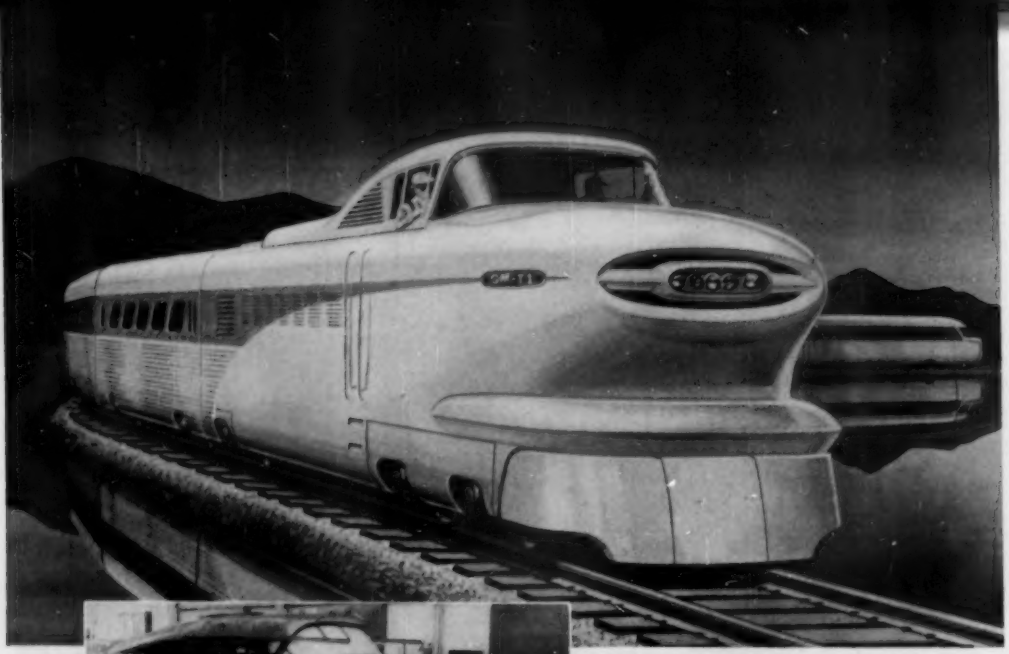
The problem: synchronizing a 2,500-frame-a-second color camera—the film whips through at 40 m.p.h.—with the strike of a rattler, within the 1⅝ seconds before the film ran out. It took seven months to solve.

Since the rattler refused to work on cue, the photo team devised a sensitive electronic relay to synchronize camera and whirling rings of flash bulbs with the reptile's whims. The platform was covered with a copper screen wired so that movement of the snake's head would alter the electrical field.

In the split second between the start of his strike and the instant he drove his fangs into the target, the rattler triggered the equipment that took his portrait.







DESIGNER'S SKETCH became a hard-shelled reality in General Motors' La Grange, Ill., shops. Behind a wrap-around windshield, enginemen will pour 1200 hp. into one four-wheel truck.

Light, Fast Train Built Like Buses

A NEW train that looks like a string of buses headed by an overgrown sports car is designed to slither over the high iron at 100 m.p.h.

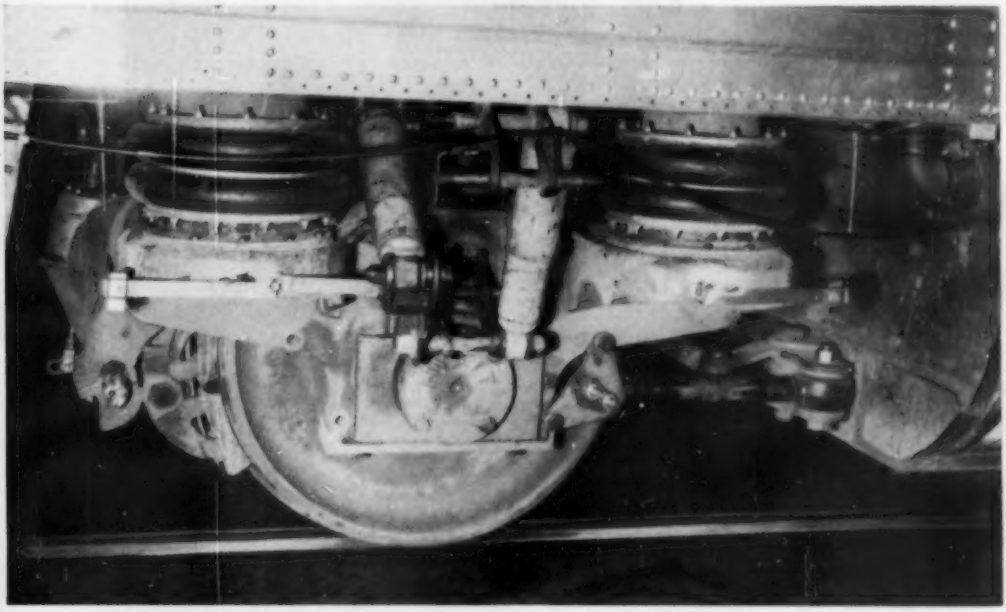
Planned for economy, to help the railroads overcome their present $700,000,000-a-year deficit on passenger operations, this General Motors mainliner can whisk 400 passengers between New York and Chicago on $128-worth of fuel oil—that's 32 cents a head. More important, its builders say it can be mass-produced for $900 per car seat, or less than half the cost of any other streamliner on the rails today.

To effect these savings, GM—a pioneer maker of diesel locomotives—has again dipped deep into its bag of automotive tricks. GM believes that to attract new customers railroad passenger cars should not be built to last half a century. So its designers took the most modern version of GMC's 40-passenger intercity bus, replaced the driver's compartment with a vestibule, and slapped the lightweight aluminum body—minus the engine—between two railroad car ends anchored to a tough underframe. At the end of seven years, they say, you throw away the body and pop in a new one.

After its première this month at the "Powerama," GM's World's Fair of Power in Chicago, the GMLT (for light train) will do its stuff as a demonstrator on the Pennsy and the New York Central. If it answers the $700,000,000 question, tomorrow's rail fan will be calling trains by the year and model.

COACHES ARE A COMPROMISE between abnormally low-hung cars now being built by ACF and Pullman-Standard, and conventional passenger equipment. All builders face the problem of high-level platforms. GM hinges back the roof to provide the necessary head clearance.

FOR GROUND-LEVEL PLATFORMS the hinged roof section stays in place, but vestibule hatches are retracted. It's only three steps up to the car floor. Because all auxiliary apparatus is in the locomotive, luggage can be stored below the coach decks, bus-fashion.

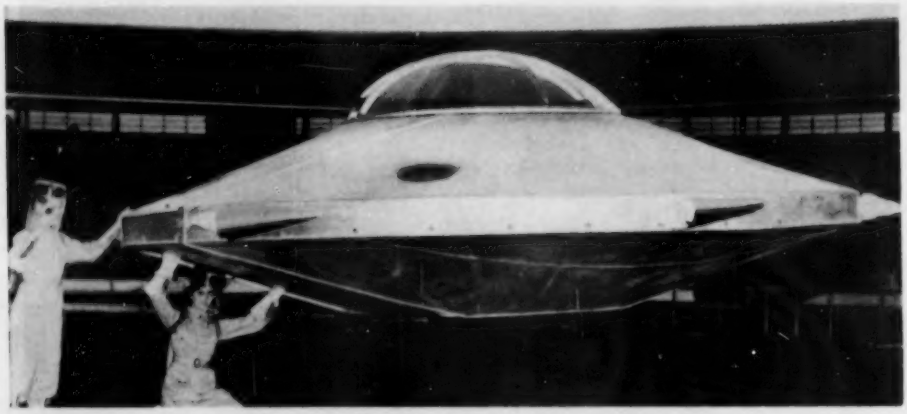


COACH BODIES FLOAT ON AIR—jumbo bellows ballooned with compressed air piped from the locomotive. Time-tested on GMC's intercity buses, they give a smoother ride than steel springs. Side-lash is controlled by pneumatic snubbers. In addition to conventional airbrake equipment, the train has dynamic (electric) braking on the locomotive's power truck.

MOBILE COMMUNICATIONS CENTER, built for civil defense, can be used in any emergency. Equipped to broadcast on the two assigned CD frequencies, it can also hook up with police, highway or forestry networks and tie into radiophone switchboards. The bus carries walkie-talkies and a public address system for field use.

Rolling Radio Backstops CD

IF ANY of California's 10 Civil Defense regional control centers were knocked out by a bomb strike or other disaster, one of these mobile radio stations could quickly take over from the nearest habitable point. The emergency communications vehicle can send out messages on 34 frequencies and tie into all emergency networks. A 10,000-watt generating plant supplies power for radio, floodlights and other uses. Two mobile control centers are now in operation, and five more are planned.



Who Says Flying Saucers Don't Exist? This One's For Real

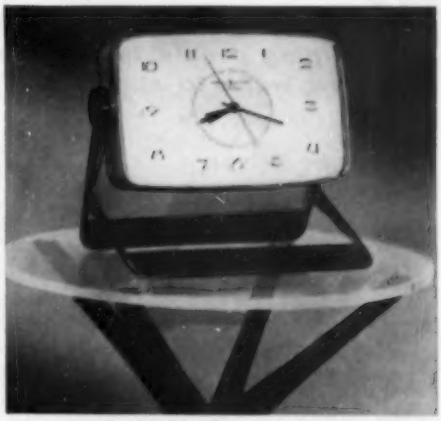
LET there be no arguments about optical illusions—this soaring disk is the McCoy. But the two Martians, alas, are only auxiliaries in Britain's Royal Air Force. The Maintenance Command of the RAF built the flying saucer for an armed-forces parade.

NO SWITCH is needed to turn the Touchtron lamp on or off. Merely touching two metal surfaces of the base triggers a midget tube that operates a relay that does the job. Tube, relay and circuit, all specially designed, are contained in the compact box at left. GE says the unit is shockproof, durable and unaffected by changes in temperature or humidity.

Trick Lamp Lights World of Future

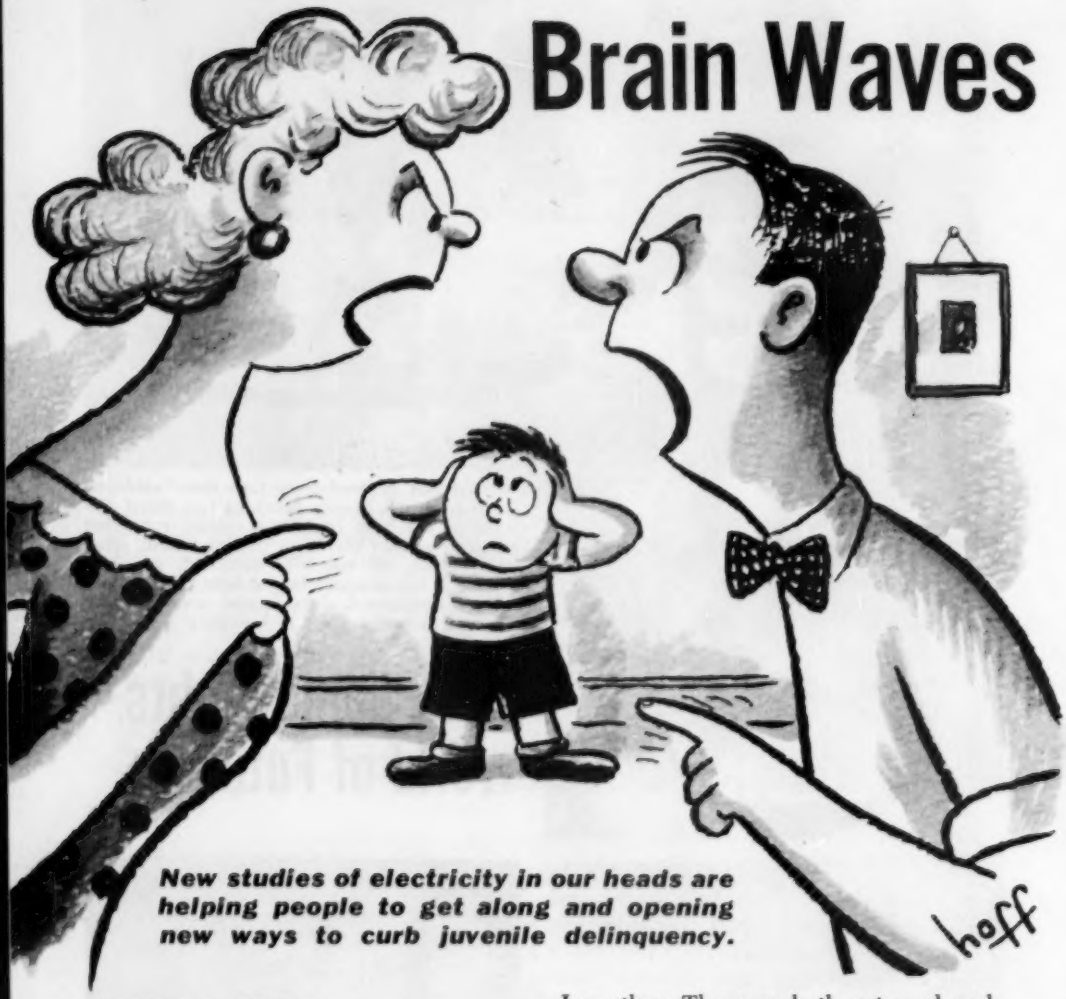
WHAT'LL they think of next? A lamp that snaps on without a switch and a cordless electronic clock that automatically keeps itself accurate. And that's only the beginning, says General Electric, which is now producing these two items.

For the future, Dr. W.R.G. Baker, general manager of GE's electronics branch, foresees many other devices to keep homemakers happy. In 1956, GE will introduce an electronic oven that will cut cooking time to a sixth or eighth. And some day, predicts Dr. Baker, a dust eliminator will clean the whole house at the flip of a switch; supersonics will wash the laundry; a TV eye will watch the kids; and an automatic programmer will switch all the gadgets on and off.



NO CORD feeds this clock juice—it's self-powered. And it's always accurate: A tiny electronic circuit keeps it in exact synchronism. It will be on the market in '56.

Brain Waves



New studies of electricity in our heads are helping people to get along and opening new ways to curb juvenile delinquency.

By Bruce Bliven

A YOUNG couple whom I'll call George and Helen seemed gloomy as they sat across the table from a professional marriage counselor.

Both were good-looking and attractive. Yet:

"We irritate each other all the time," said George. "We're always getting on each other's nerves."

Helen nodded in sober agreement. "Whenever anything has to be decided," she said, "George looks at it one way and I another. Then we both get mad and end up in a quarrel."

The marriage counselor, suspecting the trouble, sent the couple to a testing laboratory. A few days later, when the results were in, he summoned them.

"You two have very different rhythms," he reported, "in the electrical waves which sweep through your brains all the time, just as they do through the brains of all of us. The result is conflicting temperaments."

Startling advances have been made in the study of the electrical processes of

Explain Family Fights

the brain. The results are throwing new light on crime and opening new ways to treat juvenile delinquents. They also are helping normal people to avoid trouble.

Scientists are now able to tell, in many cases, whether a bride and groom are likely to get along well. The experts can also predict this about business partners—or people contemplating any sort of close, continuous relationship.

Suppose that the newly available evidence indicates that an engaged couple is likely to have difficulties. Should they avoid getting married?

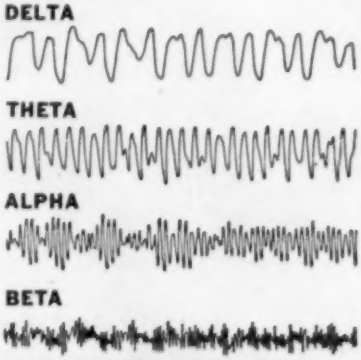
No, certainly not!

Forewarned by what the scientists have to tell them, the couple will know how to avoid such pitfalls.

Brain waves are among the most fascinating phenomena that science has discovered in recent years. Your brain, spinal cord and nerves contain what is in effect a wet-cell electric battery, generating about a twentieth as much electricity as a flashlight battery. The electric charge results from the interaction of two chemicals, sodium and potassium; when a nerve is at rest, the potassium is inside it and the sodium is outside. If the nerve is stimulated, these two exchange places in a few thousandths of a second, an electric current is created, it flashes a signal up to the brain, a decision is taken, orders go out over the nerve system, and action ensues. This tiny amount of electricity in the body is responsible for all our actions.

In addition to the electrical currents that are generated when a nerve is stimulated—as when you prick your finger—there are two other kinds. One of these is an automatic series that controls the unconscious functions of the body— your breathing, your heartbeat, the regular contraction of the muscles which forces the blood to circulate through your arteries and veins.

The other is a series of rhythmical bursts of electrical energy in wide areas of the brain—the famous brain waves.



BRAIN RHYTHMS fall into four types, or frequencies. Delta, at .5 to 3.5 cycles a second, is the slowest; Beta, 14 to 30, the fastest.

There are hundreds of these rhythmical waves, occurring in different patterns in one or several parts of the brain, and of these at least four occur so often and so regularly that they have been identified and named with letters of the Greek alphabet—Alpha, Beta, Delta and Theta.

Electrodes can be fastened to the skull to transmit these rhythmic brain pulsations to pens moving over a strip of paper. This machine is called an electroencephalograph, or EEG for short. It is far more complicated than the description would suggest; some EEG machines record 20 or more simultaneous "brainprints." A device called a toposcope summarizes many data obtained simultaneously from a single brain, and shows them on the screens of small cathode-ray tubes, where the expert can read numerous revealing facts about the mental processes of the individual under examination.

Here are the significant facts about the

BY READING RIPPLING LINES on brain-wave charts, being recorded here, doctors at Bradley Home, Riverside, R. I., can detect and often locate brain damage. Treatment runs gamut from special drugs to psychotherapy.

SENSITIVITY OF BRAIN and nervous system is determined as stroboscopic lamp flashes on and off about 15 times a second. Patient's eyes, responding to light, send signals to visual centers of brain.

Brain-wave studies also are used in treatment

PATIENTS ARE INTERVIEWED three times a week in special therapy rooms. These are simply playrooms for two, a child and a psychiatric worker. During conversation, the worker learns the child's problems and anxieties.

CHILDREN CAN SMASH anything they want to —so long as they don't hurt themselves or the worker. Here a child shoots a dummy with a play gun. After such outbursts, a child can often learn to handle his feelings differently.

four best known among the brain waves:

The Alpha wave is eight to 13 cycles per second, usually two or three strong beats followed by four or five weaker ones. One person in five has no Alpha, which means that he is very visually minded, as in the case of George, described above. One person in six, on the other hand, has a strong and persistent Alpha rhythm. With most people, the Alpha waves tend to disappear when their eyes are opened and they are engaged on a problem; but the one in six of whom this is not true has hardly any visual image at all. They are in the position of George's wife, Helen.

A powerful and persistent Alpha, even with the eyes open and in the midst of intellectual activity, can be a sign of trouble. In normal people, a slow Alpha rhythm begins at age three to four, and a faster one at about 13 or 14. Many adult criminals seem to have the slower Alpha rhythm of the child, which would

WALL ART—that can be wiped clean—helps disturbed children work off steam. Bradley Home is nation's only psychiatric hospital exclusively for children. The first study of brain waves in this country began here.

ONLY PET AT THE HOME is a dog, universally loved. Doctors used to assume that problem children suffered from emotional shock and strain. They may have. But brain-wave studies show brain damage has been a neglected factor.

of disturbed children at Rhode Island hospital

JUNIOR WING to main dining room is set aside for children five to eight years old. Patients live in groups of eight to 12 children. Brain-wave records are taken each year for every child under observation.

AT BEDTIME roommates prepare their dolls for night's sleep. About 70 percent of all children examined have some brain-damage signs. The effects generally disappear by the time a child reaches the age of adolescence.

appear to confirm the idea that many criminals have retarded mentality.

The Theta rhythm occurs four to seven times per second, slower than the Alpha and without the alternation of the stronger and weaker wave. It might be called the bad-temper wave; it is prominent in psychopaths of an aggressive type. When a normal, placid individual goes to sleep, his Alpha waves are gradually replaced by Theta waves, a phenomenon which might be described as a return of primitive emotional attitudes.

In a laboratory experiment, a young man had his head stroked by a girl whom he liked; as soon as she stopped, a pronounced Theta wave appeared. If two business partners both had prominent Theta waves, they would be headed for trouble; such individuals are usually childish, intolerant, selfish, impatient and suspicious.

The Beta wave, the most rapid of the

[*Continued on page 298*]

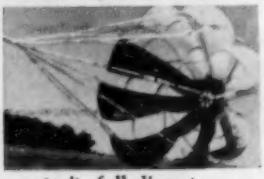
Whirling Chute Pinpoints Target

THIS Canadian parachute never stops spinning from the moment it's dumped from a plane. It puffs open, then spins itself into collapse and falls like a rock. The shroud lines then spin in reverse and unwind themselves, and the chute opens. Now the load starts whirling at the same rate, and chute and load make a gentle landing. Advantage: Its small drift makes for pinpoint target accuracy.

Wound up, it's closed . . .

. . . then begins unwinding . . .

. . . opening as it spins . . .



. . . to its full diameter.

They Say Now.....

DR. HALDON A. LEEDY, DIRECTOR, ARMOUR RESEARCH FOUNDATION: *"In the last half-century, the nation's output per man-hour has increased 500 percent."*

PROF. ROBERT S. HARRIS, MASSACHUSETTS INSTITUTE OF TECHNOLOGY: *"A practical, inexpensive diet in the United States can be based on four foods—bread, spread, milk and citrus."*

DR. W. KENNETH DAVIS, U.S. ATOMIC ENERGY COMMISSION: *"Nature has never been a respecter of . . . creeds. [Her] truths are universal and whether one prays to Christ, Allah, Lao-tse, or Jehovah, whether one wears a fez or a sombrero, Nature will make her laws known to those that ask."*

DR. T. KEITH GLENNAN, PRESIDENT, CASE INSTITUTE OF TECHNOLOGY: *"The atom may well be acclaimed the instrument whereby wars are outlawed in the days to come."*

1 Bow-and-Arrow to Cast Line. This rod would let an angler cast from close quarters without danger of snagging a branch or a fellow fisherman. Eyelets and a cord would turn the rod into a bow. The line would be drawn through a hollow "arrow" which would loft the hook and lure; then act as a float after they hit the water.

2 Spec Shield to Cut Glare. An eyeglass wearer would get extra protection from the sun if he had a tilt-up visor like this hooked over the frame of his specs. Supported by a pivot pin set above the bridge, the shield would add little to the weight of the glasses, and should be more comfortable than the conventional headband support.

3 Case to Time Thermometer. This sandglass timer shou.d tell you when you had sucked a thermometer long enough to get a proper reading. It would be built into a thermometer case that could stand on either end. By attracting a child's interest, the timer might serve to keep him quiet while his temperature was being taken.

Please turn the page for more new ideas

MORE New Ideas from the Inventors

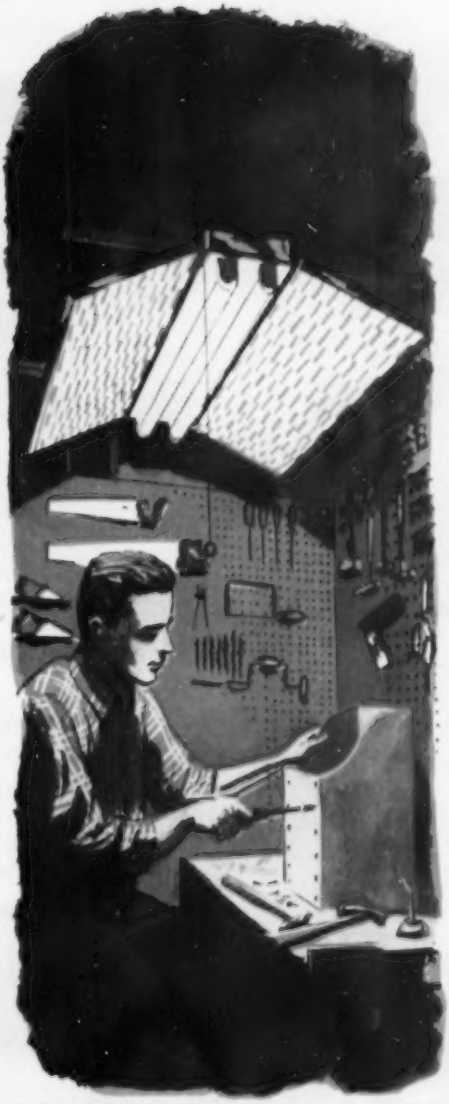
4 Serving Dish to Store Heat. Some metallic compounds absorb heat when they are melted; then give it off at a fairly uniform rate. This inventor would embed a capsule of such a material in the base of a serving dish. You would preheat it before bringing it to the table. It would then give back its stored warmth just fast enough to keep food at the right temperature.

5 Jack to Ease Wheel Change. Tire switching might be a lot easier with a jack like this to help you raise and align a wheel. You'd set the wheel on two forked rollers, lever it to the right height, and turn it on the rollers to line up the studs and holes. The mounting jack is intended chiefly for heavy truck wheels, but should also be a boon to lady drivers.

6 Trainer to Spare Trainees. Instead of hurling themselves at each other, candidates for a football squad could practice blocking on this training machine. The better man would still "break through," but he would be less likely to hurt himself or his opponent. The machine would consist of a cement-anchored standard, and a turnabout with cushioned ends. The pivoted horizontal bar would tilt under pressure to simulate shift as well as push. Either arm could be extended so that players of equal skill but unequal weight could be fairly pitted against each other. It might be most useful when a husky adult coach has to show young boys how to block.

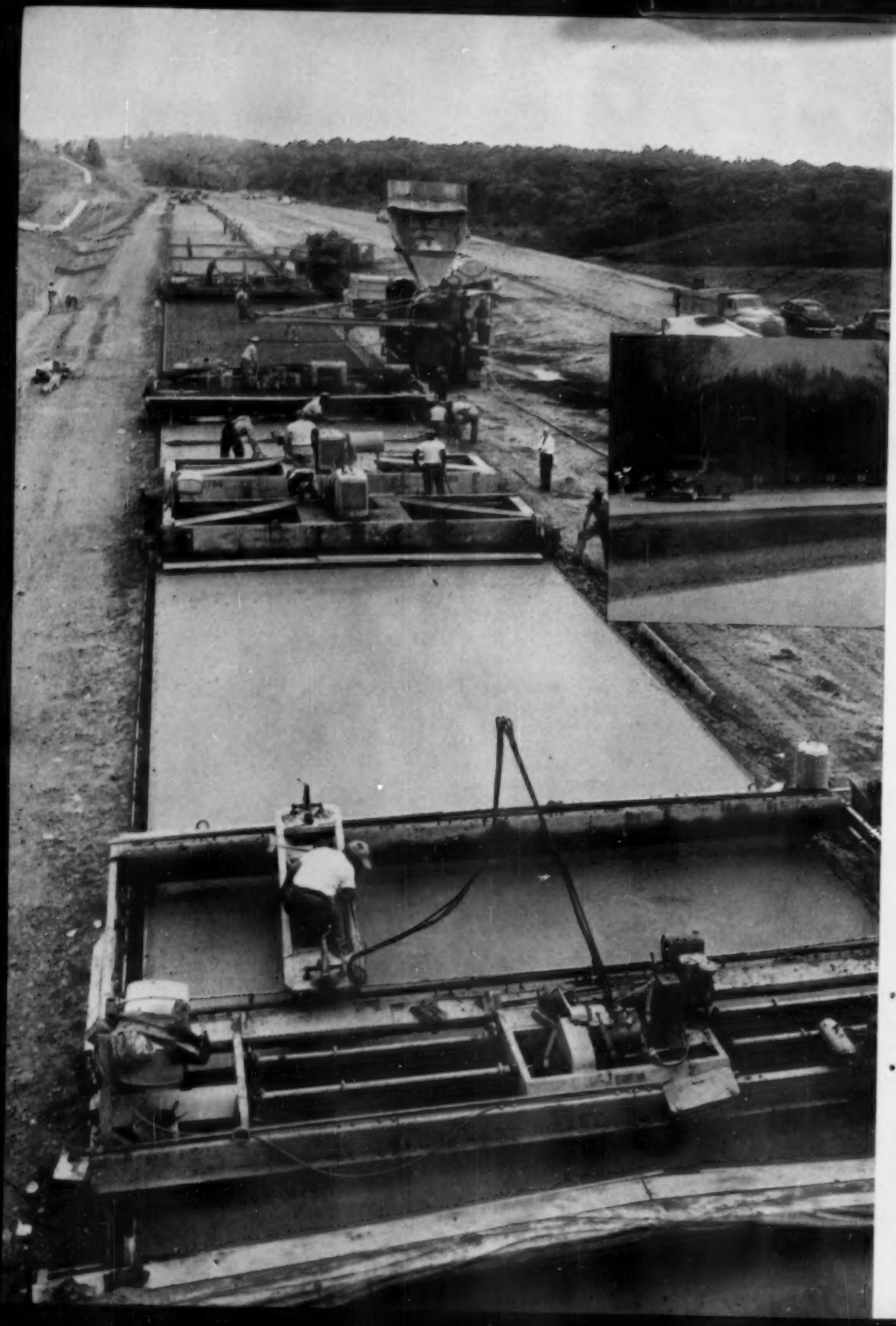
7 Home Vacuumer to Clear Drains. Air pressure from the blower end of your vacuum cleaner might unclog a stopped drain if the full push could be channeled into the right place. This attachment, made to fit on a standard blower hose, would have a small nipple that would extend into the pipe. A sealing disk surrounding the drain would concentrate the pressure.

8 Mattress to Tip for Cleaning. A housewife might gain some ground in her battle against underbed dust if the spring and mattress tilted up this way. The pivoted spring support would be counterweighted so it could be tipped up easily. Retaining arms on the sides and ends would keep the mattress from sliding off the spring.

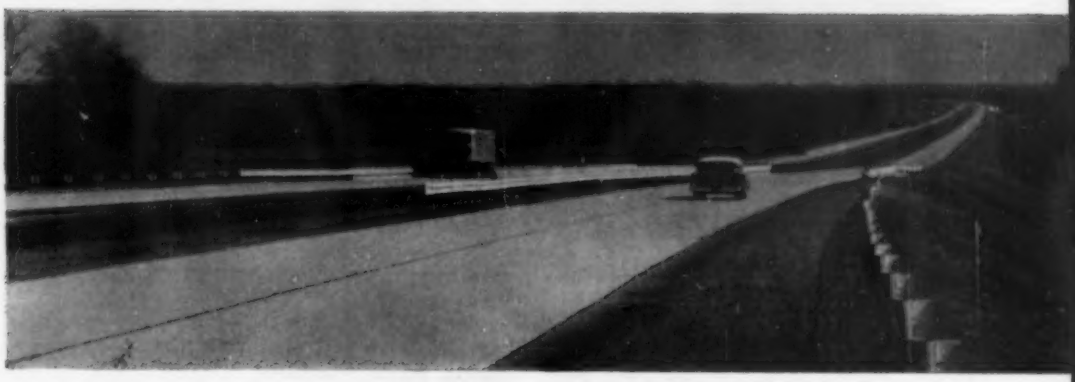


9 Reflector to Heat Room. Radiant heaters flanking these fluorescents would act both as reflectors and warmers. The inventor points out that heat reduces light output of fluorescents, but says his combination works because radiated heat bypasses the tubes.

U.S. patents on these inventions have been issued to: 1. Peter Radovinac, Cleveland, Ohio; 2. John P. Kane, Valley Falls, R. I.; 3. Roy A. Schweiger, Dallas; 4. Algernon F. Flournoy, Shreveport, La.; 5. Emil J. W. Demlo, Huron, S. D.; 6. John B. Noftsinger, Roanoke, Va.; 7. Valentine Schaefer, Dover, N. J.; 8. Edgar More, NYC; 9. Lewis L. Salton, NYC.



Super Circus Act Builds Modern Super Roads



Those graceful concrete ribbons are created by an army of skillful men who steer a kind of mechanized factory across the landscape. Nothing stops the road-building juggernauts.

By Frank Rowsome Jr. PHOTOS BY HUBERT LUCKETT

NEXT chance you get, take a hard look at a modern superhighway a-building. You'll muddy your shoes, up to the knee, and maybe get chased around by a rubber-tired dinosaur. But you'll see one of the technological big shows of our time, a circus of engineering and logistics, staged by skillful guys running big hunks of machinery. The final product, in the case of a state-spanning superhighway, is so colossal it makes an Egyptian pyramid look like a one-evening project.

By all signs, you'll have a chance to see such a show in your neighborhood soon. The 1955 highway "deficit" is worrying the brass in both Detroit and Washington. Their remedy is virtually a crash program of blowing billions on new roads. The overwhelming majority of U.S. highway miles were originally laid out for horses, and have since been patched up a couple of times for 30-hp. touring cars. If the national economy is going to keep cranking out 5,000,000 new cars a year, roads are plainly due for more than a face lifting.

Gilt-edged road. For a notion of what's in store, look at the spanking new Ohio Turnpike, due to have its ribbons snipped on October 1. One of the lushest of the new pay-as-you-go roads, it is a 241-mile link in the superhighway chain that, late next year, will let iron-bottomed autoists drive 812 miles from Chicago to New York without a traffic light, intersection,

How to pave a highway

1 A POINTER on this special tractor is kept running along a guide line established by surveyors. The cutter beneath digs out a shallow trench for the concrete form rails.

2 PINNED to the road base by long steel spikes, the forms make rails for the machinery to ride on. Here a tamper compacts the dirt under the forms so they won't sag under weight.

or stretch of two-way road. It will take only 15 or 16 hours, if you aren't a rest-stop slave.

Practically all of the OT's measurements are gee-whizzy:

• *No hills allowed.* Though OT crosses some crumpled terrain, you will be able to wheel a heavy truck across the state on it without touching the shift lever. Maximum upgrade is 2 percent; maximum downgrade, 3.2 percent.

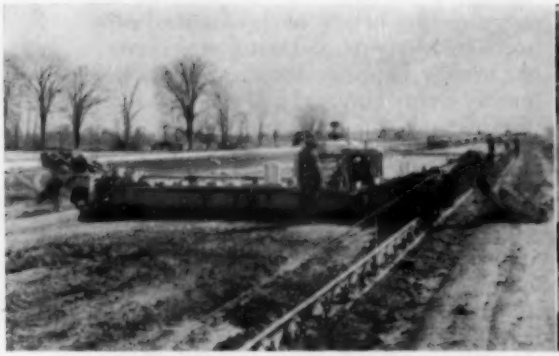
• *Twin bridges.* Whenever OT jumps a river, highway, or railroad, it marches on a pair of two-lane bridges. There is no necking down of width to permit the parsimonious sharing of a structure.

• *Sunken median.* A center strip at least 56 feet wide, depressed four feet, and sodded to slow a careening vehicle, isolates opposing lanes. It is still theoretically possible for a sleeping, crazy, or drunken driver to contrive a head-on collision, but the chances against it are almost astronomic—in contrast to the 99 percent of U.S. roads on which a head-on crunch can be set up by a wrist twitch.

• *Big deal.* The statistics are dizzy. Enough dirt and rock were excavated to dig a two-lane vehicular tunnel 286 miles long. Enough fill was dumped to cover 500 football fields with a layer 28 feet deep. Enough steel was used to build 57,000 cars. Enough paving was laid to make a sidewalk one yard wide and 4,000 miles long. One cloverleaf access road is a full 1½ miles long. So much

5 TWO BIG MIXERS spew out enough concrete for a two-lane, 24-foot road. The lead mixer lays down about five inches; reinforcing wire is added; and a second mixer finishes it off.

6 SPREADING MACHINES follow close behind each mixer. Fast-moving transverse blades spread the big gobbets dumped by mixers between the forms. Vibrators shake the concrete.



3 FINAL GRADER scrapes the road base down to exact height specified, depositing excess dirt outside the form rails. It works to an accuracy of less than 1/16 of an inch.

4 INSPECTORS use kitchen tools to measure the density and moisture content of the subbase just ahead of the paving machines. If they don't okay it, no concrete can be poured.

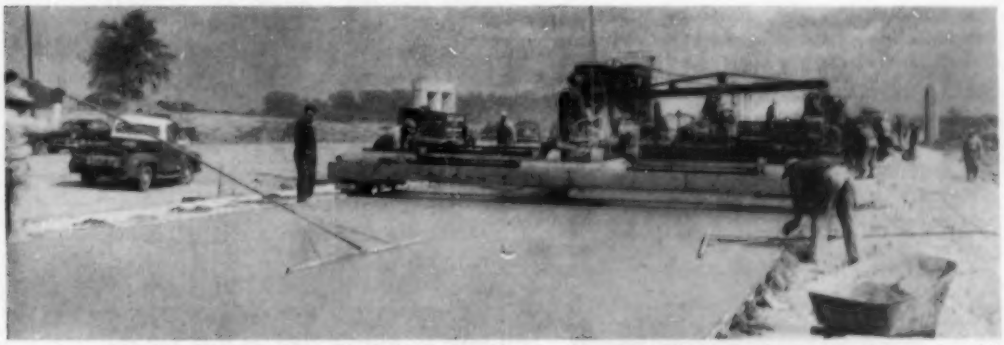
money was borrowed that the interest comes to $29,000 *a day*.

What's invisible. Even though dozens of dignitaries will point with pride on Opening Day, the big show actually will be over then. The obstacles that had to be overcome to create those graceful bands of concrete to the horizon will no longer be visible—outside of the memories of the men who faced them.

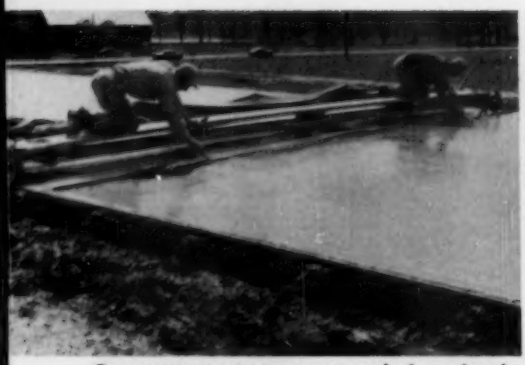
As OT's Chief Engineer Kauer points out, such a road is *not* built by a big parade of machines, led by 'dozers and ended by pavers, that march in a row across the countryside. An unrolling-a-carpet approach would invite disastrous snarls. Instead, a big road is built more or less simultaneously everywhere. Although variations in the schedule are permitted for many reasons, including weather, the general plan is to get everything done everywhere at once.

Even so, it took thousands of men and machines more than three years, to build the $326,000,000 Ohio Turnpike. No contractor, however fattened by past jobs, could possibly have tackled so huge a job by himself. So the road was sliced up into 62 separate bits, and contracts for each of them were let out to big builders from all over the country. A typical section might be three to six miles of road, for which its builder might get two to five million dollars.

Nasty surprises. Like mice, engineers can sometimes find their best-laid plans



7 FINISHING MACHINES clank along next. They are set to generate the crown specified for the road. The one shown above, the "bull float," dresses the surface longitudinally, and is a big factor in riding smoothness. Hand finishers with long-handled floats touch up spots the machines have missed. Too much handwork is both uneconomic and bad for the concrete.



8 ROLLING BRIDGE acts as a platform for the two men who pull out a U-shaped metal cap, forming the transverse joint. They also hand-trowel the edges to a durable radius.

9 SLAB IS SLIT lengthwise into two lanes by a diamond-tipped saw driven by a gas engine. This cut, 2½ inches deep, is not a true expansion joint like the transverse divisions.

10 TAR IS INJECTED into the kerf to keep out water. The purpose of the longitudinal slit is just to localize future cracking, like the dotted line on a tear-out ticket.

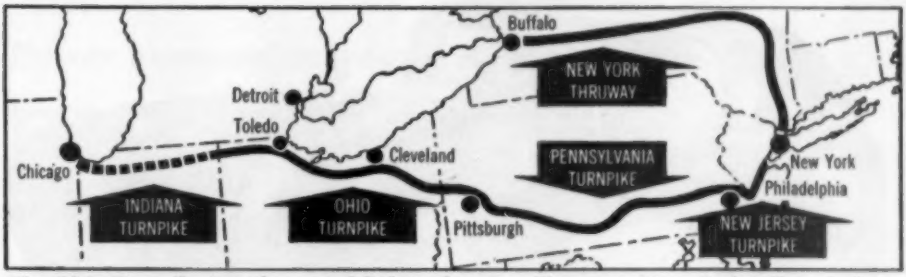
slightly agley. OT was stumped over in advance by bands of geologists, soil-mechanics experts, and test-boring crews. As usually happens, these experts were mostly right. But in the few places that they weren't, things got taut.

One problem turned up in eastern Ohio. This is glaciated country, littered with great mounds of soil and stones abandoned in the retreat of the last glacier. Trouble came when contractors began working with a clayey formation called "blue till." This turned out to be a relative of Jello. It was much too elastic —at the specified moisture content—for a good road base. Where suitable "borrow" could be had, the road builders just dug out the blue till and "wasted" it, filling in with solider stuff. In places where borrow was scarce or needed, however, they had to modify the plans and drainage systems, to "dry down" the stuff.

Elsewhere the big earthmovers (which once or twice scraped the roofs off ancient, forgotten coal mines) squished into a different headache: peat bogs. There's no magic to change a peat bog into a good load-bearing foundation. Big clamshells and draglines had to clank up and muck the peat out. Where the water level was high, they used a neat seesaw trick: they scooped out as much peat as came easy, and then dumped in the same amount of sand and gravel. Being denser, this sank through the peat, displacing it upward. Then they'd repeat —literally—until it was out.

If this was not feasible, the builders simply drove in an array of deep piles, built concrete-and-steel trestles, and marched serenely above the quagmire.

Gold-Plated Hill. Drumming along at the legal 60 m.p.h. this fall, westbound drivers nearing the Cuyahoga River south of Cleveland will be impressed by two huge, curving bridges. Costing nearly $6,000,000, they overlap a whole valley, spanning an old barge canal, the river, a railroad, and a highway. What drivers won't know, in the few seconds that it will take to whistle past, is that the inoffensive-looking hill on the east approach was the meanest problem on the



The Ohio Turnpike is to be a vital link in the new Chicago-to-New York toll-road chain.

entire highway. Turnpike officials refer to it ruefully as "Gold-Plated Hill."

The two roadways were supposed to carom off a side of this hill in a theatrically graceful swoop. But when its overcoat of trees and topsoil was grubbed off, the hill turned out to be a villain. Deep-seated slides, lubricated by internal springs, had plainly been slithering enormous masses of rock down toward the old canal that meanders by the foot of the hill. Highway engineers abhor instability like this; they had visions of waking one morning to find their graceful swoops dunked in the canal.

The remedy was complex. Some hundred wells were drilled; an elaborate subsurface drainage system was created; and a huge area of the slope was covered with a six-foot blanket of crushed rock. Loads were "adjusted" by shifting thousands of tons from a sensitive area.

The engineers won't guarantee that old Gold Plate will never act up. But they've changed this from a certainty to an improbability. Better, they've rearranged the landscape so that the "area of potential failure" has been shoved comfortably away from the road. The old villain can still make a scene, if it insists, but cannot interrupt the precious flow of toll-payers.

Crash walls. This preoccupation with keeping the cash registers tinkling is also evident at many of the 41 structures where railroads intersect the turnpike. If a derailed train should damage a bridge and block traffic, turnpike revenue would suffer. So concrete monoliths were cast to keep errant locomotives from nudging a bridge from its piers, and high steel crash walls built to keep rampaging rolling stock in its place.

Similar foresight was used at other crossings. The turnpike cuts across countless gas, water and sewage mains, and these man-serving utilities have requirements that fluctuate over the years, usually upward. To minimize future fiddling, the OT crossings were sized for predicted growth, not present needs. Pipes beneath are sleeved down to diameters that are appropriate now—but if a place grows, they'll just jack out the sleeves, and presto, bigger pipes.

Paving: center-ring act. When the pachyderm part of the road-building big show pulls out—the trundling Euclid wagons and Tournapulls; the great shovels and 'dozers; the giant sheep's-foot rollers and blade graders—they leave behind a deceptively unimpressive road base. Sure, it's better than a back-country dirt road, but it doesn't look like the millions it cost, since it conceals its own intricacies in drainage and soil engineering. It looks as uninviting as a bare black chassis looks to a lady shopping for a lavender hardtop.

Actually, however, this subbase is a highly sophisticated creation. It has been very accurately controlled (to maybe 1/16 of an inch) in direction, elevation and tilt. It is of precisely controlled density, moisture content, stability and load-bearing capacity. It is as vital to the future highway as a hull to a ship. Once the paving guys put on their frosting, the cake is done.

The frosting job is done by a paving "spread"—builders' lingo for a team of about 150 men and 20 bizarre machines.

[*Continued on page 284*]

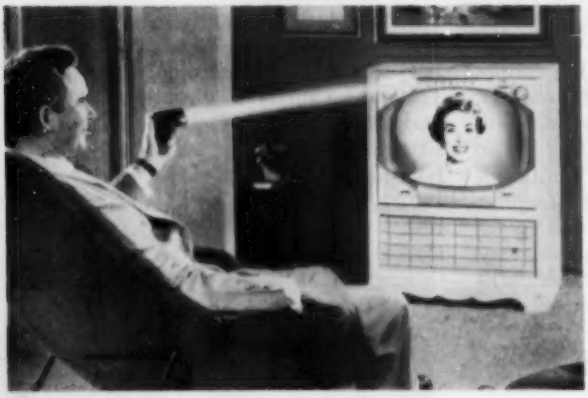
TUBULAR-STEEL BUMPERS weigh only 10 pounds each. Inside, luxurious head-pillowing airliner seats cut driving fatigue and protect riders in the event of collision or rollover. With the top up, the driver sights through the canopy to see his rear-view mirror. The fender design channels air to wheels to cool brakes and tires. Body is made of glass fiber.

Hardtop Roof Rolls Away

THERE'S a hardtop convertible that actually converts. With the top up, the car looks like half a limousine. With the top down, it's a racy sports car. William Flajole, Detroit style consultant, designed it to put his ideas on car trends on wheels. Wrapped around a Jaguar chassis and motor, his Forerunner cost him $8,000.

A simple gimmick made possible the retracting Plexiglas roof. A piece of hardware that can be bought anywhere for $6.95—a sliding mechanism for a garage door—rolls it into the tail. Flajole, who talks of speeds up around the 140-m.p.h. range, will race the Forerunner this fall.

Long Finger of Light Reaches Across Room to Tune This TV Set



You can sit in your easy chair and operate this TV set by aiming a light-beam "pistol" at four slots cut into the framework around the viewing screen. Pointing the beam at the lower left opening turns the set on (or off); taking a bead on the upper corners switches channels clockwise or counterclockwise; and a bull's-eye on the slot at lower right tunes out the sound on commercials. The Zenith Flash-Matic can be operated manually, too.

Power companies wage cold war on the

Bird That Wields an Ax

By Edward D. Fales Jr.

NEAR Lock Haven, Pa., one day recently, motorists stared in amazement. High on a ridge of the Allegheny Mountains they saw a 36,000-volt power line whose poles shone like tulips in springtime.

Looking at the yellow, red, green and white poles, the motorists may have wondered if the power companies were trying to match the automobile industry's color spree.

Fact is, the bright-painted poles are an experimental weapon of defense—against a puzzling saboteur. This saboteur has been chopping away at power poles in New Jersey, Mississippi, Pennsylvania, Connecticut, Oregon and several other states.

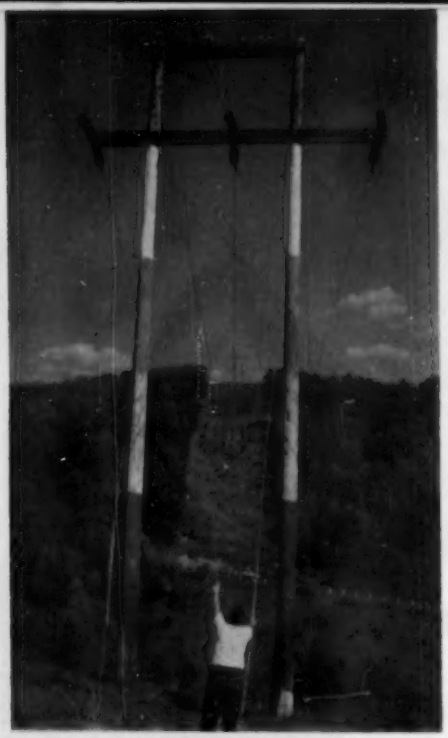
The villain is one of the strangest of birds. He's the prehistoric-looking pileated (pie-lee-ated) woodpecker, a shy lad but no sissy. He's a big redhead who wields a mighty ax—the Paul Bunyan of birds.

Not many people have seen him. Until recently he was thought to be on the way to join dinosaurs in extinction. But today he's coming back. And he's got the power engineers in a tizzy. For this big guy (spread: up to 30 inches) attacks poles like a madman with a machete.

First he braces his tail. Then in a fantastic flash of red it happens: He winds his long neck back for the pitch—and delivers. BOOM! You can sometimes hear the blow a mile and a half away. Then he cocks his head, listening. Flash-BOOM! He hits again.

Suddenly he goes crazy. Boom—boom—boom! Like a fast-firing fieldpiece. The

PILEATED WOODPECKER gets his name from his red-crested pileum—top of his head. Wings are black with white markings. If you see one in action, you'll never forget him.



ANTIDOTE FOR WOODPECKERS (will it work?) are the colorful stripes painted on these power-line poles. Holes in pole at right were chopped by the birds before the poles were painted.

chips spew out like empty shells from a machine gun. Now and then he'll rip out a small plank and heave it over his shoulder. In a few minutes he can cut a hole nine inches deep and a foot high. Sometimes he goes right *through* the pole.

Secret of this great strength is a "molded unit" chopping machine. Unlike other birds, the pileated has a bill and skull fused in a single piece.

Because it costs $500 to replace a big electric line pole, the power companies are trying desperate cures:

• *Green garden hose* is draped around poles to look like bird-eating snakes. The Bunyan birds just sneer.

• *Spinning metal flashers* scare them away, but they come right back.

• *Hardware cloth* is wrapped around poles. In Mississippi this baffles the pileateds, which are slightly smaller in the South. But in Pennsylvania the Yankee pileateds rip the ½-inch, 19-gauge steel mesh right off.

• *Red flannel streamers* are nailed to poles. The birds merely shred them and use them to line their nests.

Now the frantic power engineers have turned to forestry scientists at Penn State University for help. A three-year research project is being paid for by four companies: Pennsylvania Power & Light, Northern Pennsylvania Power, West Penn Power, and New Jersey Power & Light.

Being scientists, Dr. William C. Bramble and his Penn State associates want first to learn *why* the Bunyan birds prefer poles to forest trees.

"Some people think they're attracted by wire-hum," says Dr. Richard Jorgensen.

One man who found pileateds chopping his roof off suspected they were attracted by the hum of his old electric clock. He threw it away and got a new, quiet one. The birds went away.

A top birdman, Dr. A. A. Allen of Cornell University, notes that wire-hum also causes poles to hum. The birds, he says, may think they hear insects.

Latest attempt to scare off the birds is the Lock Haven, Pa., "totem pole" experiment.

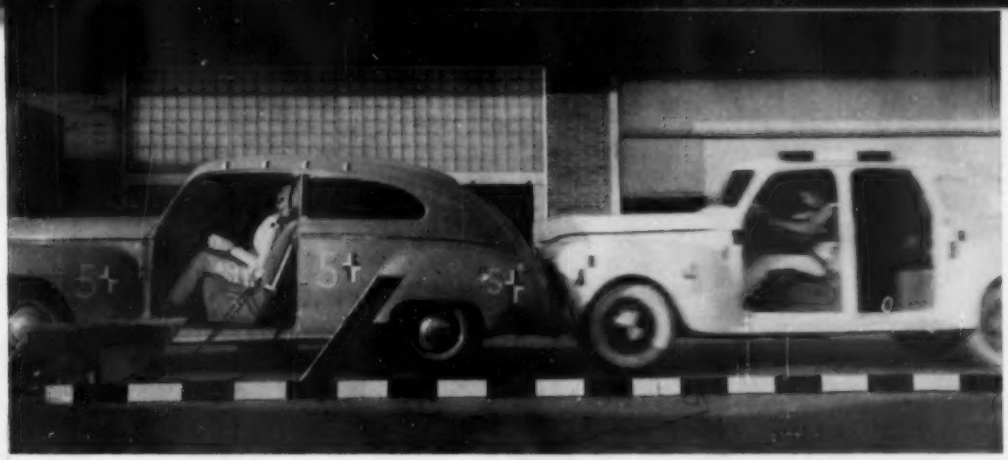
Two miles of power line have been painted. Between every four pairs of painted poles are two pairs left unpainted. These are monster poles, two feet thick and 58 feet tall. The bottom 10 feet were left unpainted. Ten feet up, a red band begins. At 20 feet red changes to green. At 30 feet comes yellow, and at 40 feet a band of glistening white that runs up to the wires. Above the wires the poles are bare.

Birds dislike some colors—and the scientists hope that green, red, yellow or white will drive pileateds away.

If not, the foresters have other ideas. The poles may be painted with bad-tasting chemicals.

Or you may soon see dummy kingbirds standing guard. Most birds fear the scrappy king. Will wooden kingbirds bluff the pileateds?

The power companies, counting their losses in thousands of dollars, desperately hope so. END



Danger at 7 M.P.H.? Yes, Say Experts

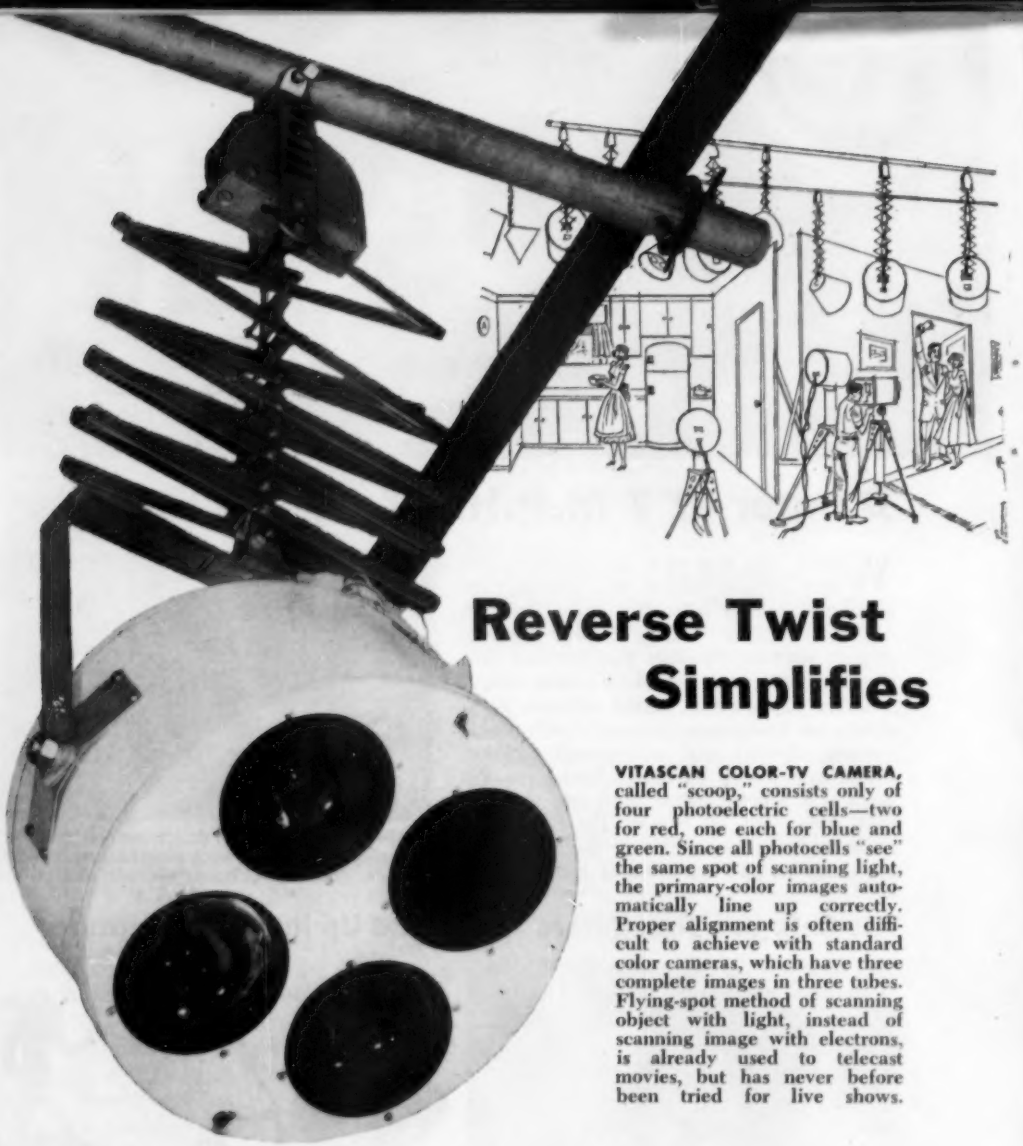
WHEN you stop your car suddenly and tires screech behind you, hunch your shoulders. It may save your neck. Tests on UCLA's campus with a $3,500 dummy rigged with instruments proved that this simple precaution can prevent serious injury.

Other experiments by the California Institute of Transportation and Traffic Engineering showed that a rear-end collision at 10 m.p.h. can do more damage to the neck of a relaxed driver than one at twice that speed. At 20 m.p.h., the front seat flexes backward and the rear end of the hit car tends to take up some of the shock.

SNAPPED LIKE A WHIP under sudden force of 150 pounds, dummy's neck reacts as unprepared driver's would in seven-m.p.h. rear-end crash.

Kit Gets the Youngsters All Wound Up in Wire Sculpture

THIS youngster is busy with a new hobby —"sculpturing" figures from wire. To make the little man, he just winds wire over wire. Jigs are used to make the bases, hats and lamppost shown above. The Suji kit contains wire in three gauges, covered with insulation in several colors, plus all the necessary tools. X-Acto, Inc., 48-41 Van Dam St., Long Island City 1, N.Y., makes it.



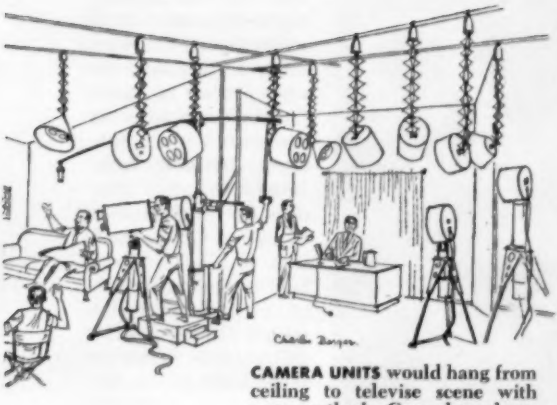
Reverse Twist Simplifies

VITASCAN COLOR-TV CAMERA, called "scoop," consists only of four photoelectric cells—two for red, one each for blue and green. Since all photocells "see" the same spot of scanning light, the primary-color images automatically line up correctly. Proper alignment is often difficult to achieve with standard color cameras, which have three complete images in three tubes. Flying-spot method of scanning object with light, instead of scanning image with electrons, is already used to telecast movies, but has never before been tried for live shows.

THE thing above that looks like a floodlight is really a color-television camera. The thing at the right that looks like a TV camera is really a light. This topsy-turvy arrangement is expected to reduce the high cost of color-television shows and result in more color.

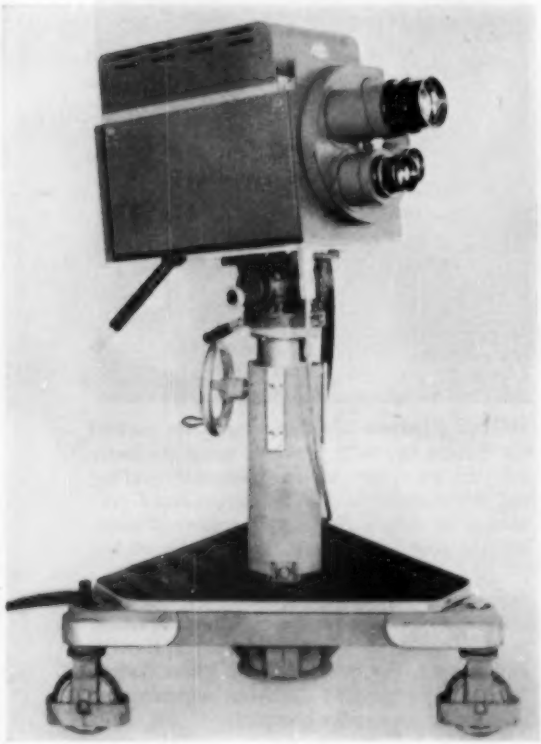
Du Mont's Vitascan system reverses the standard television setup, in which the scene is evenly illuminated and the picture is created by an electron beam that scans across a lens image of the scene. With Vitascan, the light (a tiny spot created by an electron tube) scans the scene point by point. Light reflected from the scene is picked up by simple and cheap photocell units.

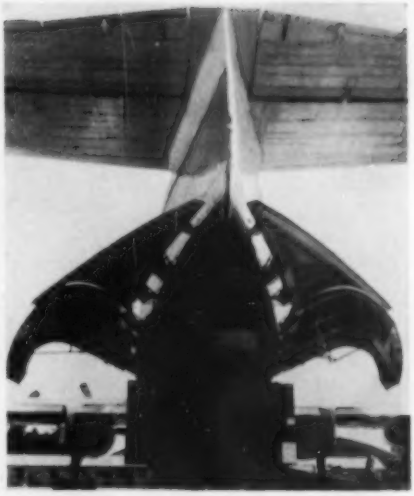
Since the system requires a dark studio—lighted only by the tiny moving spot—how do the actors see? The spot goes on and off 60 times a second; during its off time, the set is illuminated by stroboscopic lamps that also go on and off. The strobes are on when the scanner is off and vice versa. To the actors, the set seems evenly lighted.



CAMERA UNITS would hang from ceiling to televise scene with new method. Cone-shaped reflectors contain strobe lamps that provide light for the actors and technicians to see by.

Color Television





Two-Deck Plane Swallows Car

THE fuselage of this giant Air France plane splits open to reveal a rear cargo door large enough to drive a car through. Passengers ride on the upper deck, cars and other cargo below. The plane is a Breguet "Deux Ponts"—double-decker.

Keys Widen Harmonica Range

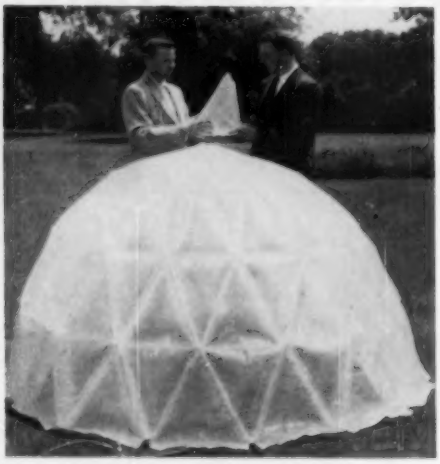
YOU can get a wider range of sound with this German keyboard harmonica—single tones as well as chords of three and four notes. The manufacturer is Matthias Hohner A.G. of Trossingen in the American Zone of Germany.

Bolivia: Aircraft flying into the world's highest commercial airport at La Paz (elev. 13,504 feet) are now guided by radio "tracks" beamed in all directions from this corrugated-iron hub. Besides being a rendezvous for llamas, it houses South America's first VOR—very-high-frequency omnirange transmitter. Its signals blanket a circle 260 miles in diameter across the high Andes.

From a tiny jet to a Tibetan ghost trap . . .

Pictures Span a World at Work

Great Britain: The deaf and blind woman at the right, above, reads a message as it is tapped out on a new "Arcaid" typewriter. The standard keyboard lifts Braille pins against the reader's fingers.



United States: Weather domes for everything from life rafts to whole cities are foreseen by inventors of this pneumatic igloo, Air Force major G. W. McCauley and U. of Illinois professor A. C. Richardson. Plastic admits light; air pockets insulate the cover.

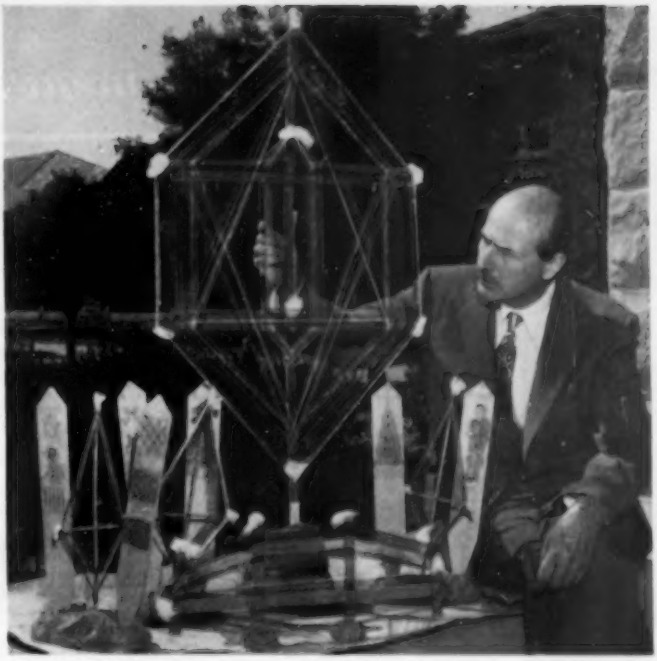
Germany: The Hamburg fräulein at left purchases her bunch of tulips by dropping coins in the slot of a flower automat. Different flowers are displayed behind glass doors. Prices range from 13 cents for boutonnieres to a dollar or more for bouquets.

Tibet: Build a better ghost trap in the Himalayas and Tibetans will beat a path to your mountain peak. This is one of 14 varieties of traps found by Stanford professor Frederic Spiegelberg on a recent trip to Tibet. Each type takes care of one of 14 kinds of ghosts.

Since all Tibetan ghosts are liquid, it's said, a trap is discarded when wet (sure sign it has served its purpose).

Pictures at the base attract ghosts who, on entering, tangle yarn and snarl themselves in wool tufts.

Traps come in five colors. Some are 10 feet high.



France: It may look like a toy to the boy perched on its wing, but this jet, the world's smallest, can do a man's work.

The Payen PA-49, has a wing span of under 17 feet, will fly at 310 m.p.h. at about 28,000 feet. The tiny jet was displayed at a recent aviation show.

Italy: If you have around $1,300 and a landing plot 150 feet long, the M.D.B. helicopter-plane may be for you.

This metal-body, plastic-wing craft weighs about 500 pounds, has a 35-hp. engine and a top forward speed of about 90 m.p.h.

How Government sleuths will

STATIC THE WORLD OVER is plotted on a transparent world globe like this at radio propagation engineering laboratories of National Bureau of Standards in Colorado. Contours of radio noise grades, used in noise prediction, are both geographical and seasonal. Bulk of interference is from thunderstorms.

Cut That Static

Charting world's radio noise will improve home reception, make seafaring, flying safer.

A FEW miles from the foothill town of Boulder, Colo., stands a little plywood building with a tall rod on its roof. From the base of the rod, a radiating pattern of wires extends.

To everyone thereabouts, save a handful of men in the know, it is a mystery house. Nobody lives in it. A human being seldom visits it. It's as silent as a tomb. At night it emits no light.

Yet it is part of a world-wide research project that could have come straight from the pages of a science fiction book.

From the plywood building, and eventually dozens like it, will be drawn information that will provide you with better radio reception. It will make your airline flights safer. It will give you clearer voices on transoceanic telephone calls. It will help minimize the dangers to coastal shipping in stormy, thick weather.

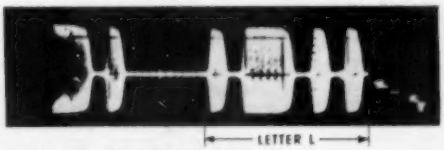
The plywood building houses equipment designed to chart the world's atmospheric static. The anatomy of static will be outlined, in this and similar little buildings, for the first time since man sent an interpretable signal through the ether 60 years ago.

Static is radio's villain. It makes the earth's atmosphere one great boiler factory. It is the basic limitation on reception. A radio station can send a message halfway around the world, but static may interfere with reading it.

AUTOMATIC EQUIPMENT in "doghouses" records static levels. Its own heat warms the building in winter. The bulbous projection at the side is a thermostatic blower.

Static plagues ships at sea and airliners winging between cities. It interrupts vital telephone conversations. It makes hash of the Beethoven or bebop coming

Oscillogram record shows how static smears man-made radio wave



CW (CONTINUOUS WAVE) SIGNAL

CW SIGNAL WITH NOISE

SCIENTIST CRICHLOW checks the filters and amplifiers in static recorder. It measures static in only a few channels at a time, and screens out regularly propagated signals.

from your home receiver. It has figured in disasters and near-disasters. A few years ago an airliner bound from New York to Miami had to crash-land in an Adirondack Mountain forest. The cause: storm and static.

Only a pittance of the incredible volume of static is man-made. A little local static is created by diathermy machines, fluorescent lights and make-break circuits like those in ignition engines. Some static, of less consequence than atmospheric noise, comes from the galaxy of stars of which the earth's solar system is a minute part.

Electrical-storm static causes most radio engineers' headaches. At any moment of the day or night, some 2,000 storms are in progress in the world. In any 24-hour period, there are 50,000 of them. Every thunderstorm causes static.

It varies in volume. At one location, on one radio frequency, static can range from one power reading to another 1,000,000,000,000 (one thousand *billion*) times as great. In an area where several separate storms are in progress, as many as 3,000 impulses a second, of varying intensity, have been recorded.

The vibrations set up by lightning discharges are husky. They can travel from San Francisco to Singapore. The energy in a single flash of lightning (termed electromagnetic by the scientists studying the problem) could, granted a constant voltage, light up more than a thousand 100-watt household bulbs for one hour.

Radio experts know what static *does*. They know less about what static *is*. But what interests them most right now is *where* it is and in what volume. If they can determine approximately how much static, of what frequencies, will occur at a given place at a given season by day or by night, they can go a long way toward pulling its teeth. They can't do anything to prevent it, but they *can* do things to soften its effects.

That's the reason for the plywood building. The rod on the top fingers the atmosphere for static. The radiating wires are a sort of bucket to keep the received static from draining off into the ground before it is measured. Inside the building is elaborate, automatic measuring equipment. Static traces its presence with styluses on recording drums.

This building, a "doghouse" in the slang of National Bureau of Standards engineers who put it up, is the first of perhaps 50 the bureau would like to see erected all over the world. A temporary unit is planned for Antarctica. Greenland will get a permanent one.

When all of them are operating, an 11-year study will have been well launched to find out the habits of static. It will take 11 years because that is the cycle of sunspot activity. Sunspots affect atmospheric static.

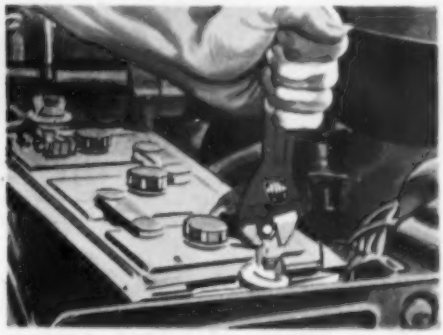
Plotting noise levels the world over will permit engineers to establish power levels for broadcasting and radio communication at the right points to override static interference. Today it's a guessing job. Most wave-propagating stations—as the scientists put it—boom forth with a wattage to drown out static

[*Continued on page 288*]

I'd Like to see them make...

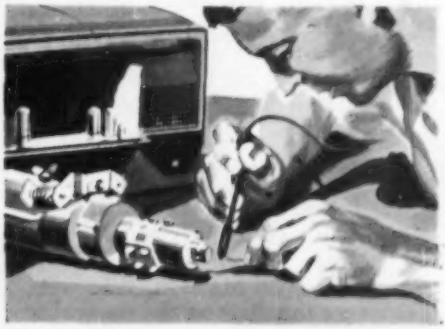
AN AUTOMATIC BOWL SCRAPER on electric mixers. It would be fixed to the mixer body so that it would always be just out of reach of the beaters.—*Mrs. Wm. Killion, Reelsville, Ind.*

AN ILLUMINATED GREASE GUN so a mechanic could find all the fittings on a car without the nuisance of a portable light.—*Brian Gubler, Idaho Falls, Idaho.*



A SHOCKPROOF BATTERY WRENCH for safer work under the hood. It would be entirely coated with plastic, except at the nut opening. —*Eldon E. Manke, Wahiawa, Hawaii.*

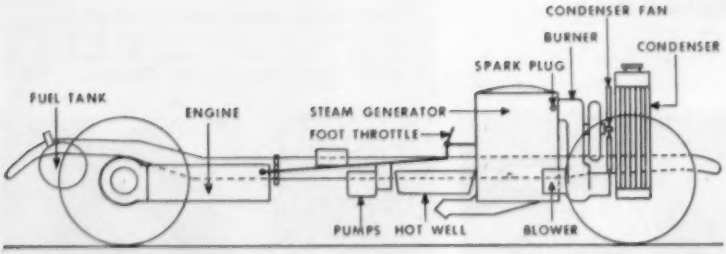
AN INK-SIGNALING BALL-POINT PEN with an ink of a contrasting color at the end of the filler. It would warn of need for a refill.—*Stanley D. Stillion, Pasadena, Calif.*



DOUBLE-FILAMENT TV PICTURE TUBES so that when one filament burned out, voltage could be rewired to the second filament's set of pins. —*J. D. Ducharme, Holyoke, Mass.*

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE MONTHLY readers. What is *yours?* We will pay $5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

This Fast-Firing Steamer Cost Its Maker $100,000



ULTRA-FAST STEAM BUILD-UP and fuel-water economy are big steamcar advances of the Keen Steamliner. To build up steam in 35 seconds and run 100 miles on a gallon of water he uses a "supercharged" power train (above). To clean the boiler every 500 miles, he blasts off excess steam (right).

Wisconsin engineer's unusual coupe swishes from zero to 80 with a surge of silent power.

By Kenneth Wylie

ABOUT the only thing quieter than Charles Keen's car is the jaw of a hot-rodder dropping open as he sees Keen scoot his coupe away from a standing start and evaporate down the road.

His Steamliner, a handmade, 2,900-pound steam auto, took nine years to build. It cost him around $100,000.

"Want to take a spin?" he asked when this reporter showed up at his die and stamping firm in Madison, Wis.

Opening the door on the car was like taking the back off a fine Swiss watch. This car wasn't pasted together with a welding rod; anything that someday might want to be repaired or improved was neatly machine-screwed or bolted on.

At the wheel, the stern mold of Keen's face softened. He even smiled as he flipped the ignition key. I knew that the old Stanleys and Whites had needed to simmer for 15 or 20 minutes after fire-up—that the steam pilot was a tranquil gent who lit his burner and then settled down to some tea-sipping while waiting for things to percolate.

Keen had me foxed. He just twisted a fuel valve, unlatched the parking brake, and tromped on the throttle. Suddenly my head had an affinity for the parcel ledge behind. We catapulted down the driveway, hooked around a corner and rocketed along a boulevard.

At first there was a muffled rushing sound, such as St. George might have heard at zero hour with the dragon. Then virtual silence. At stoplights we showed our trunk lid to every car. When occasion allowed, we shot rapidly beyond 60 m.p.h. in eerie silence, as though we were coasting down an invisible hill. By straining my ears I could hear a faint pulsation from the two-cylinder steam engine.

The only dials on the panel that Keen

watched were a steam-pressure gauge and a lubrication indicator. I noticed that when the former dropped down to 1,000 p.s.i., there came that curious exhaling sound, like a distant, asthmatic dragon, which meant that the burner jet had snapped on. It was all automatic: a single spark plug fired a jet of No. 1 furnace oil, a steam turbine spun a blower that whipped the flame into torchlike intensity, and the pressure needle swept up toward 1,300 pounds. Then we spooked along in silence while I held on to my hat.

The other gauge told Keen how things were in the lube department. An oil drought in the cylinders of this engine could carve up the carcass in no time. A small but continuous supply of oil metered into the steam feed lines prevents this.

Keen explained that we had been able to start even though we didn't wait to warm up, because the Steamliner bottles enough heat and pressure to spin the wheels instantly even after sitting for four or five hours. A dead-cold start takes about 30 seconds in warm weather, and almost a minute in winter. He gets around 14 to 16 miles per gallon of furnace oil, about 25 miles per gallon of water in summer and 100 miles on cold winter days.

Keen gets a bit cagey when describing the engine. He explained, though, that it is a two-cylinder, double-acting job that directly drives a gear meshing with the differential gear. Most of the engine is slung between the frame side rails under the car. Because every stroke is a power stroke, its two cylinders are roughly comparable to an eight-cylinder gasoline engine. But only roughly: because of steam's enormous low-speed torque, the engine needs no transmission to baby it.

Out in the country, Keen showed me how the Steamliner can do tricks. First cautioning me to brace myself, he reached down and flipped over the reverse lever while we were rolling forward. The car squeezed down to an immediate stop

and whooped backward. He showed me how the wheels could burn rubber easily on acceleration from a standing start. Chasing around turns, the car gamboled right along with the best road cars, since its low-slung engine and steam generator keep the center of gravity much lower than normal. On straights we zipped up to 80 m.p.h. and held it.

Speed is red-lined at 80. Though it wants to go faster, Keen doesn't want to risk rolling it up. It's not that he's afraid of a boiler explosion; there's never enough water and steam in the one-tube semi-flash boiler to make much of an explosion even if something did let go. He's simply leery of working the engine as fast as it wants to go.

STEAM-GENERATING HEART of Steamliner is this aluminum-clad flash boiler under the hood. A jet burner fires over a single steam tube.

One recent experience suggests to him that the Steamliner doesn't need to be gentled. He was moving briskly along a highway when an oncoming car swung directly into his lane in a misjudged effort to pass. Keen had always assumed that steamcars were too brittle and ponderous for jeeping, but on this split second he had no choice except to head cross country. The car belly-flopped along the soft ditch and bank contours. When it came to a stop, he noticed that there was a good head of steam still waggling on the dials. He nudged the throttle, and the car climbed back on the pavement and set off again with no-fuss competence.

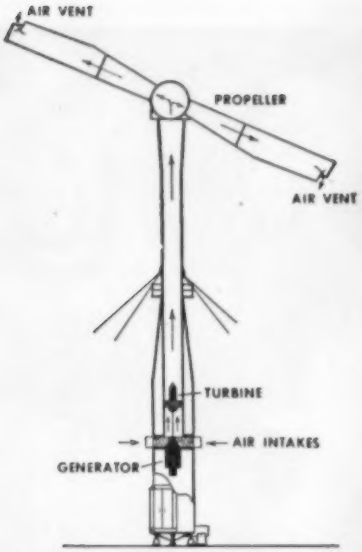
His interest in steam comes to Keen naturally; his great-grandfather and grandfather manufactured steam engines in the last century. Though trained as an aeronautical engineer, Keen himself has long been a steam enthusiast. His present car has logged more than 40,000 miles and acts as if it were barely broken in.

We pulled off the road for a look under the hood. It somewhat resembles the wedding of a 1933 washing machine with the works of an air conditioner. There's an atomizing burner, electrically ignited; a "supercharger" that is actually a turbine-powered air blower; a turbine-driven fan to draw air through the radiator-like condenser, and pumps to draw fuel from the rear tank, to distribute lube, and to take water from the "hot well," forcing it, in proportioned amounts, into the single coiled boiler tube.

The car will run on virtually any combustible liquid, including kerosene, gasoline, oil and alcohol. Keen gives the nod to furnace oil because it's cheaper than gasoline and doesn't roar in the burner the way gas does. Boiler clogging seems to be almost no problem, perhaps because of the scouring speed with which the water flashes into steam. But as a precaution, Keen gets rid of any liming by blowing down the boiler about every 500 miles.

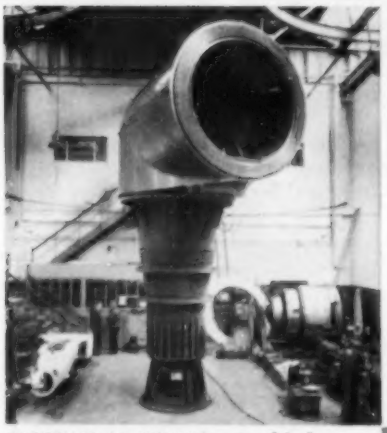
On the road home we toyed with a few V-8s and then did a Casey Jones back to the shop. Keen began explaining some more of the good things about the Steamliner. Not only does it go fast and far on one filling, but its comparatively simple innards need about as much maintenance as a wheelbarrow. Nothing touches the engine except steam and oil. The result is that the steam engine is still smooth and tight long after a gas engine, with its witches' brew of gas, oil, additives, acids and water, is crying for an overhaul.

For the future, Keen won't admit to any plans for moving his steam enthusiasm from a hobby to a commercial basis. He is considering the idea of fitting a steam generator and engine in a sports-car chassis. He figures he might really trim the boys with the noisy exhausts. He might, too. END



FLOW OF AIR into pedestal near base, up its interior and out blade tips is shown in this sketch. System provides a fluid linkage between power source —the propeller—and turbine. This, coupled with variable propeller pitch, saves strain on the turbine when the wind velocity changes.

Now There's a Turboprop Windmill



WHAT'S the latest thing in generating electricity? Atomic energy? Harnessing the tides? No—it's a windmill at St. Albans, England, with a spanking new idea behind it.

The propellers turn freely in the wind—no gear train holds them down. But—the blades are hollow. As they turn, centrifugal force causes them to shoot air out through vents at their ends. That creates a semivacuum inside the 100-foot-high pedestal the propeller sits on. Air rushes in through ports and, on its way up, turns a turbine that drives a generator. As in airplanes, the blade pitch is varied automatically. So the turbine stays at reasonably constant speed in changing wind velocities.

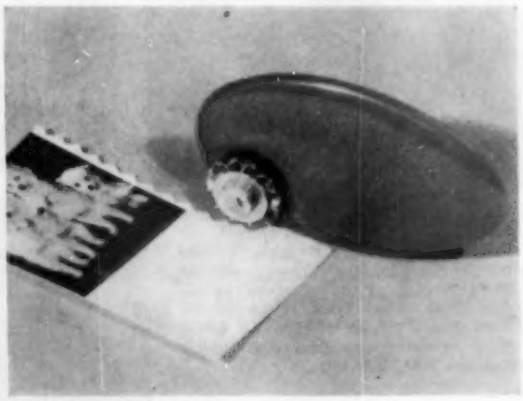
PROPELLER IS MOUNTED on this huge head (above). At right is shown one of two blades, each weighing 1,600 pounds. Air flows out through slits in cutout at tip. Prop revolves at 95 r.p.m. over wind-speed range of 30-60 m.p.h. Turbine rotates at 1,000 r.p.m. to drive the generator which produces 100 kilowatts.

New Aids to Living...

Pocket Recorder: Five hours of talk or 2½ hours of music squeeze into this tiny wire recorder, the Minifon P55. It runs on battery or AC, records sounds up to 20 feet away on one-ounce reels, comes equipped with hand mike, wrist mike, foot switch and earphones.

Milk Dispenser: This machine handles milk with the greatest respect in order to pass strict health laws on milk dispensing (must not splash against or touch machinery). Drop a coin in the slot, and a pair of rollers trap milk in a rubber hose running from the milk reservoir. A third roller then gently urges it toward the spigot. Result: Grade A right in the cup for the thirsty little girl in the photo above.

Deckler: Photographers can fancy up their prints with cut deckled edges by just scooting the Accura Deckler along picture edges. The adjustable pinking wheel is stamped out of high-grade steel and honed on all 44 cutting edges.

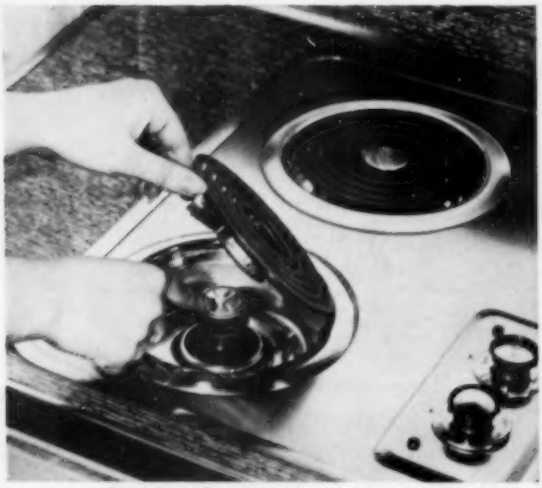


Further information about the products described on these pages can be obtained from the following sources: POCKET RECORDER: Geiss-America, 6424 N. Western Ave., Chicago 45; MILK DISPENSER: Mr. Robot, Inc., 12 E. Grand Ave., Chicago; DECKLER: Spiratone, 49 W. 27 St., NYC; PHONE BRACKET: Jordenis Metalcrafters, 5642 S. Rutherford Ave., Chicago 38; CURRENCY CONVERTER: I. & M. Ottenheimer, 23 S. Howard St., Baltimore 1; DENTAL BAR: Kay's, P.O. Box 213, Englewood, N. J.; PRECISE RANGE: Admiral Corp., 3800 Cortland St., Chicago 47; REFLECTIVE CLOTHING: Minnesota Mining & Mfg. Co., 900 Fauquier Ave., St. Paul 6, Minn.

Phone Bracket: Telephones can be placed anywhere if mounted on the Hold-A-Phone. Its black-oxide brackets come with clips, expanding plugs, and screws for mounting on any kind of wall. The phone base fits into bracket corners.

Currency Converter: You can figure dollar exchange for 26 foreign currencies on this Bakelite vinyl Dollar Dialer. It gives the value of the basic foreign unit in U. S. currency, number of units per dollar, and value of various U. S. amounts.

Dental Bar: Thumbscrews, instead of your fingers, put the squeeze on the toothpaste tube in this stainless-steel toothbrush rack and dentifrice dispenser. A hinged cap at the bottom lets the ribbon of toothpaste out; notches hold six brushes.



Precise Range: By setting two dials (at right in photo) on the new Admiral Dial-Temp range, a housewife can run hairline temperature control on her cooking. Dials are calibrated from 145° to 425°, and twin thermostatic switches compensate for changes in pan temperature. Control contact with pans is made through the mushroom-shaped thermal element at left.

Reflective Clothing: Millions of tiny glass lenses embedded in Flecton yarn make the shirts and caps on the two shorties glow—but only in concentrated light such as that from auto head lamps. Treated clothes are visible up to five times as far as ordinary garments. Minnesota Mining developed Flecton; clothing firms have glimmer duds ready for this school year.

Disaster's Near Miss Designed This Fireboat

By Gardner Soule

A fireboat saved the Port of New York on Saturday night, April 24, 1943. Because she did, New York City now has a new fireboat, the *John D. McKean.*

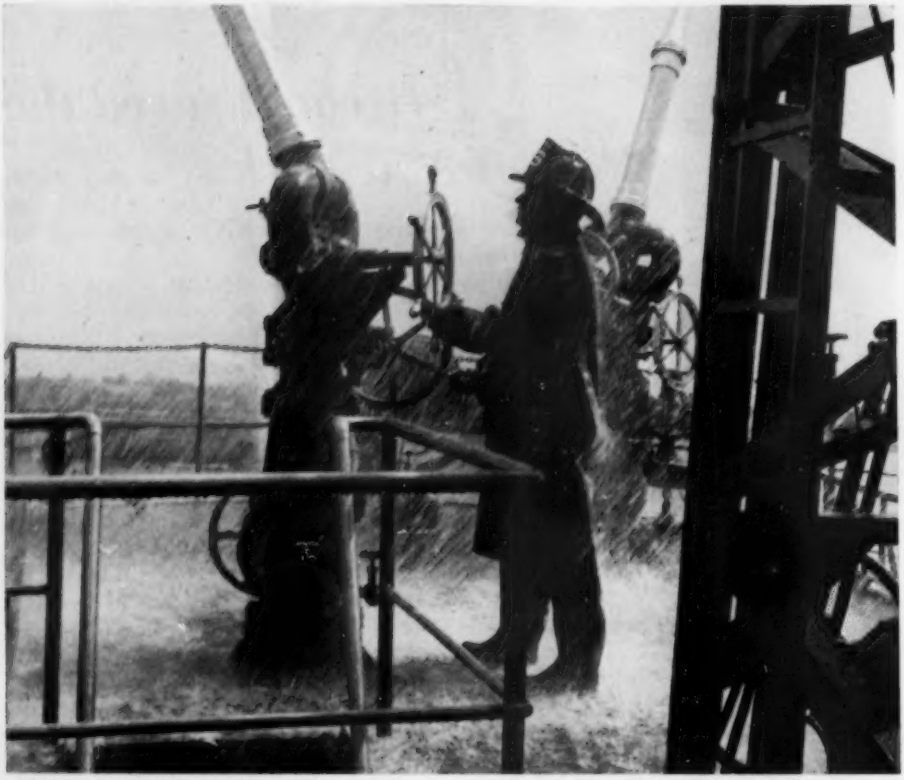
It took months to plan the new fireboat, a year and a half to build her, and months more to commission her. But the new boat actually was designed between five p.m. and midnight on April 24, 1943—the night New York City almost blew up.

5 P.M., APRIL 24, 1943

The *Fire Fighter,* New York's biggest and most powerful fireboat then, was tied up at Pier 1, Manhattan, down by the Battery, on that fateful evening. "I noticed, across the bay, between Liberty [the statue] and Staten Island, something smoking," Jack Shearer, the *Fire Fighter*'s pilot, recalls. "Fire headquarters sent us out. We went right down—no delay."

The fact that there was no delay may have saved New York, and that was Lesson No. 1 for the builders of the new *McKean.* The *McKean* has heaters that keep her lubricating oil and water—and therefore her engines—warm at all times. The pilot's bunk is in the pilothouse right by the wheel. He is always on board. So are the engine-room men. And the firemen are always on Pier 1, where they can leap aboard in seconds. It's these first few seconds that

Model of the McKean's pumping system helps locate any trouble.



"THERE'S MORE WATER ON DECK," says Capt. Roald Olsen, "than in the river when all the nozzles are going." Men aim them like AA guns. The deck has a non-skid surface.

count. Diesel-powered (like the *Fire Fighter*), the *McKean* gets into full speed ahead quicker than previous boats. She can do 13 knots. When the *McKean* first reached New York harbor from her builders in Camden, she sailed right away from the fastest tugboats in the bay.

5:30 P.M.

"We got to the fire in a few minutes," Shearer continues. "What I saw was the freighter *El Estero,* of Panamanian registry, near an Army pier. She had been loading explosives. As we came in, we started water immediately."

That was Lesson No. 2 for the *McKean's* builders. The *McKean* can hurl water across several hundred feet. She can shoot right over barges or ships to pour water on a blaze.

The ammo ship was already adrift when the *Fire Fighter* arrived. "A derelict," Shearer says. The fire had burnt away the lines that held her to the pier. The *Fire Fighter* had to go alongside, take the moving, blazing vessel in tow, then haul her away from the shore, away from the main shipping channel. This called for intricate maneuvering.

For the fastest changes of direction possible, the new *McKean* (like the *Fire Fighter*) has pilothouse controls. The skipper himself controls the engines; he does not need to signal the engineer to change speed or reverse. In the *McKean's* sea trials, it took only 15 seconds to reverse from full speed ahead to full propeller speed astern. She also changed direction of propeller rotation forward and backward, six times in 59 seconds.

The *McKean* can turn on a dime because one of her twin propellers can be

reversed while the other goes forward, and because of her rudders. They are operated hydraulically by two pumps. Either pump will work the rudders, and the pilot, by push buttons, can apply the power of both pumps to the rudders at once. When he does, the rudders move faster than when operated by only one pump.

6 to 8 P.M. Shearer spent these hours contemplating *El Estero*'s deck cargo and trying to drown the fire. The deck cargo was torpedo warheads. "Ever look at a warhead?" Shearer asks today. "It's a hell of a feeling. Each is like 50 men with rifles looking at you. If any one had started away, she'd have went." To get water into *El Estero,* Shearer says, "we used every means we had. All the nozzles, including the one on our tower. We also used open 3½-inch hose—without nozzles. It was volume we needed."

This was another lesson memorized by the designers of the *McKean.* She has a capacity of 14,000 gallons of water a minute at a pressure of 170 pounds per square inch. Or she can drown a fire with more water at less pressure. The *McKean's* capacity is equal to that of 14 of the city's biggest land pumping trucks.

The *McKean* has six fixed nozzles. One is a tower nozzle, 39 feet above the water line, to shoot in any direction, particularly down into a ship's hold, and to sweep the decks. Just like a gun, this nozzle (and the others) may be pointed up or down, right or left. A man can climb the tower to direct the aerial nozzle, but normally he will aim it electrically from the decks below.

8 to 10 P.M. Coast Guard vessels and police launches warned other ships away from the vicinity, and Shearer watched them scatter.

In nearby Bayonne, N. J., disaster squads of physicians and nurses were mobilized. The Brooklyn and Staten Island police notified all precincts that there was "imminent danger of an explo-

WIDE-VIEW PILOTHOUSE has special heat-treated glass. Duplicate controls on either side of the wheel work the engines directly: Skipper doesn't need to signal below.

FIREBOAT CARRIES NOZZLES by the dozen for various uses. She is, says New York Fire Commissioner Edward F. Cavanagh Jr., equipped to take care of any harbor fire.

ENGINE ROOM, as designed by John H. Wells and Associates, is an intricate mass of machinery. Ventilation is normally by intakes and exhausts located in the fireboat's stack.

sion." New York City radio stations went on the air advising all residents to raise windows a few inches (against concussion) and to stay away from windows. Jersey City police cleared industrial plants.

If *El Estero* blew, blazing fragments might have (1) touched off other ammo ships all over the bay; (2) ignited land tanks of gas, gasoline and oil; (3) set off the largest ammunition dump in the U.S. on the Jersey shore. Where it would have stopped, no one knows.

FOR DENSE SMOKE or toxic gases, this fireboatman wears an oxygen mask under a hard-shelled helmet.

While each minute seemed an hour, the *Fire Fighter*—now assisted by another fireboat, the *John J. Harvey*—poured water on *El Estero*, and maneuvered her, at half speed ahead, to a spot in the bay where it would be safe to sink her. Once there, even more water was needed. The blazing *El Estero* could not be boarded; her sea cocks therefore could not be opened; and the only way to sink her—and to get New York City out of danger—was to pump water into her. It takes an awful lot to sink a sea-going vessel.

Water was needed also to keep *El Estero's* plates cool. At any moment they could have gotten red- or white-hot and thereby set off her below-decks explosive cargo, and then et cetera, et cetera, et cetera.

The newest and most important feature of the *McKean* is the direct result of the *Fire Fighter's* having to tow and pour water on that ammo ship at the same time.

The *McKean*, unlike any previous fireboat, can tow with full power and pump water with full power simultaneously. Two 1,000-h.p. diesels drive her. Two more 1,000-h.p. diesels operate the pumps.

It required a lot of engineering to get all this machinery into a fireboat only 128 feet 9 inches in over-all length and only 30 feet in beam, but in the case of the *McKean* it has been done. She is, so far as New York City engineers know, the first fireboat ever to have separate propulsion and pumping engines.

All this machinery at first caused the *McKean* to vibrate excessively. After exploratory tests, she was drydocked and the shaking was eliminated by the addition of fins on both sides of her hull to control the flow of water around her propellers.

Smoke, the fireboatman's greatest dread, took its toll on the night of April 24, 1943. "There was a blue haze over you all the time," says Shearer. "It cut your throat. It cut your eyes."

So the *McKean* was designed to keep smoke out of the engine room. It can be sealed off and oxygen pumped in.

The waterfall striking *El Estero* filled the surrounding harbor with parts of her cargo and debris. And this, too was considered by the *McKean's* designers. Her two propellers are built into the hull, in semi-tunnels, affording a measure of protection against submerged debris.

10 to 11 P.M.

El Estero was at last sunk. Men finally climbed aboard her superstructure, which remained above the water, and which had been alight, to be sure the fire there was out. "She was dead out when we left her," says Shearer. The Navy issued a radio announcement: "It is believed . . . the danger of an explosion is past . . ."

Federal civil defense officials later called the night of April 24, 1943, their worst night of the war. But the lessons of that night have not been forgotten. New York City's Public Works Commissioner, Frederick H. Zurmuhlen, says he is proud of the *McKean*, and several other cities have, or are adding, fireboats. END

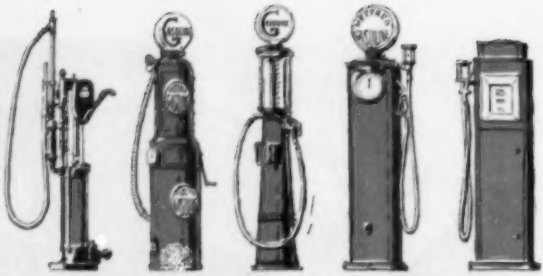
Lush Hot Rod Packs Triple Threat

CHARLES TATUM of Stockton, Calif., wanted a car that would drag, road-race and serve as a highway roadster. He got all three in this surface-hugging sportster. A four-speed Jag transmission lets him loaf on city streets, push the speedometer up to 110 on drag strips or wham along at a top speed of 141 m.p.h. in all-out racing.

His swanked-up hot rod is wrapped in an aluminum body. This yellow shell sweeps over the chassis in an almost unbroken line and tapers to a teardrop at the tail. All four fenders flare upward to aid brake cooling. The 1,860-pound car, built on a 102-inch wheelbase, carries only one tail light and no bumpers.

HOOD AND FENDERS tilt forward on hinges at front of car to lay bare a Wayne GMC 240-hp. engine. This permits the driver to talk easily with the mechanic during pit stops at races.

DRIVER RIDES LOW in car only 32 inches high at the cowl. Cabin-cruiser panel houses instruments. Tachometer registers up to 8,000 r.p.m. and the speedometer can clock 160 m.p.h.



EARLY (1915) | STANDARD (1922) | VISIBLE (1925) | ELECTRIC (1929) | COMPUTING (1935)

EVOLUTION OF GAS PUMP is shown by a leading maker's designs. In horseless-carriage days of 1910, Gilbert & Barker firm introduced simple non-measuring pump at left; later, measuring types above, of which first three were hand-operated and last two, electric.

How a Gas Pump Works

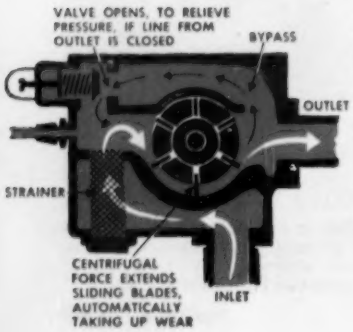
PULL up at a modern gas pump, and a precision machine whirs into action. Electric pumping delivers your gas. Dials count gallons and tenths, and automatically add up your bill.

Here's the inside story of the kind of gas pump in widest use today. Pictured in detail is the Gilbarco 906 Calco-Meter made by Gilbert & Barker Manufacturing Co., West Springfield, Mass.—a leading designer whose past and current models reflect the changing styles.

Yesterday's pumps, hand-operated, dispensed gasoline in two steps. First gas was raised to a calibrated level in an enclosed or visible chamber, serving as a measuring can. Then it drained through the hose and an open nozzle into an automobile's tank. Both before and after, the hose had to be empty to give accurate measure.

Today's electric pump measures and delivers gas in one operation. Gas always fills its wet hose and flows out when the attendant, having started the pump motor, opens a hand valve in the nozzle. Meanwhile a meter measures the exact amount delivered, and actuates figures in windows, showing quantity and price.—*Alden P. Armagnac.*

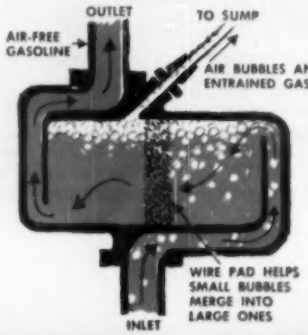
The rotary pump . . .

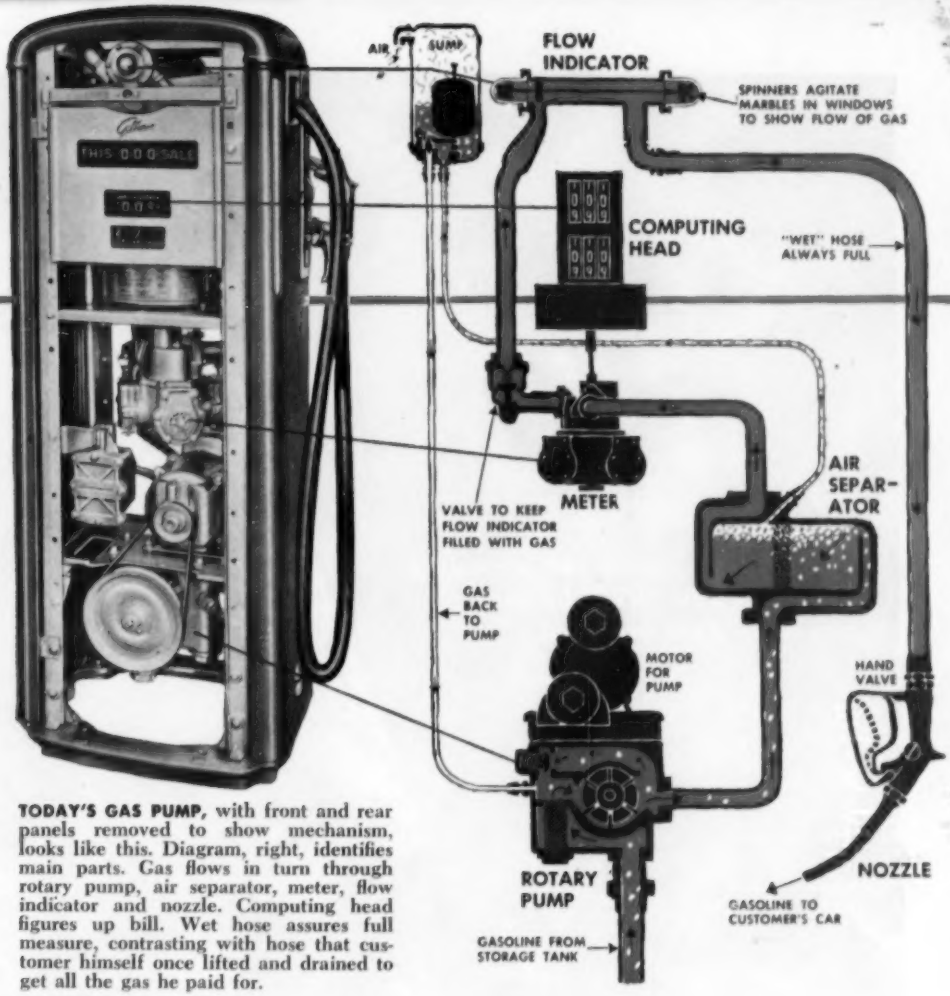


. . . supplies gas, from storage, to maintain flow when hose nozzle is opened. Gas takes bypass route if nozzle is closed. Pump's rotary-blade design has positive pumping action on both liquid and vapor, as required to handle volatile fluid like gasoline.

The air separator . . .

. . . removes air and vapor so gas can be measured accurately. While shown separately for clarity, separator is currently built into rotary-pump unit.

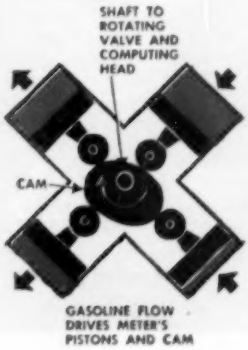


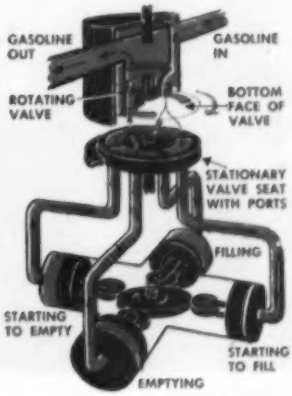


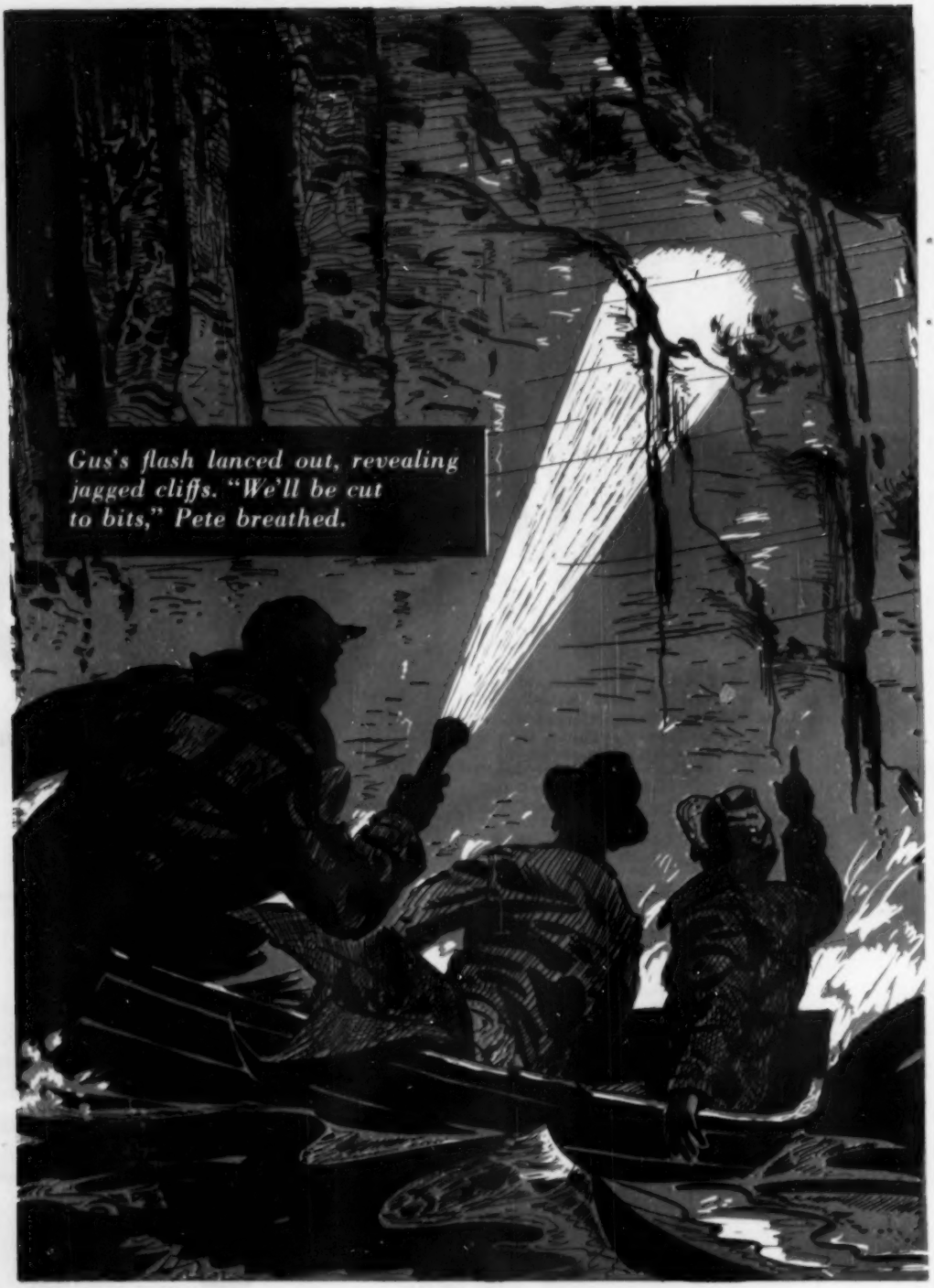
TODAY'S GAS PUMP, with front and rear panels removed to show mechanism, looks like this. Diagram, right, identifies main parts. Gas flows in turn through rotary pump, air separator, meter, flow indicator and nozzle. Computing head figures up bill. Wet hose assures full measure, contrasting with hose that customer himself once lifted and drained to get all the gas he paid for.

The gallon-counting meter . . .

. . . acts as a four-cylinder hydraulic motor. All gas flows through it—and in doing so, drives pistons, cam, rotary valve and shaft to computing head. Eight revolutions of cam register one gallon. Simplified diagrams show principle rather than actual compact design. Calibrating adjustment, not shown, makes positive-acting meter accurate to within one part in 3,000.







Gus's flash lanced out, revealing jagged cliffs. "We'll be cut to bits," Pete breathed.

Gus Takes to Water

By Martin Bunn

GUS WILSON, genial proprietor of the Model Garage, and two fishing buddies were on their long-planned vacation at last. And they were having the time of their lives. On a sheltered cove of a lake in the rugged wilderness of the northeastern highlands of Minnesota, Gus had just hooked the biggest fish of the trip.

"Keep him out of the brush!" Pete Vancourt whooped.

Elmer Stoddard worked determinedly with the oars to keep the 14-foot, flat-bottomed skiff away from the shore. Gus, in mackinaw and battered hat, leaned into his rod as a monster northern pike went into the air.

"Whee!" Gus yodeled, and his joyous shout was tossed back from the forested peaks surrounding the lake.

Gus finally brought the great pike in close.

"Got him!" yelled Elmer, as he batted the fish over the head with a wild swing of an oar.

"Man, what a fish!" Gus exulted, admiring the green, pale spotted prize. "This one alone makes the long trip up here worth while."

"Sure does," Pete agreed. "We'll fish this cove again tomorrow."

Gus looked up at the evening sky. "Right now, we'd better head for camp—we've got 10 miles of lake to cross."

"Let's go," said Pete. He pulled the starter cord on their three-horse Lauson motor. "We'll make camp by dark."

THE motor sprang to life and the skiff swung around. As they came out of the sheltered cove they met a stiff headwind which was beginning to pick the lake up into curling whitecaps, and a lashing of spray came over the bow.

"Hey," Elmer complained, "Quarter those rollers, Pete—what are you trying to do, drown us?"

"Camp," Pete reminded him, "is straight across the lake. I'm not running in circles for a little blow like this. Water'll do you good, Elmer—you haven't washed up since we left home."

"We won't make camp by dark," Gus remarked, after a while. "This wind is holding us back. We should have

brought Elmer's six-horse motor along."

"Pete's three-horse is better for trolling," said Elmer, tossing a coin expertly in the air and catching it. "Heads, you do the cooking tonight, Gus—tails you wash dishes."

"I lose either way," Gus protested, grinning, wiping the spray from his leathered features. "Hey, what's wrong with the motor?"

Even as Gus spoke the motor suddenly died.

"Can't be out of gas," Pete said. "I just filled it today."

"Didn't sound like gas to me," Gus said, whipping out a flashlight. "Keep her head into the wind with the oars, Elmer."

"How can I? I broke one oar on that fish of yours—all I've got now is the handle."

"Fine," Gus said ironically. "Light the gas lantern, will you, Pete? It's there under the forward seat."

"Yes, Madam, we probably have one of the most thorough driving schools in the country."

Gus bent over the outboard and shut off the gas petcock and the air vent, unclamped the motor and swung it inboard. Spray lashed over the gunwales.

"This motor," said Pete, "is old perpetual motion itself. Never have had any trouble with it before."

"You've given it a lot of use," Gus grunted, taking out the single spark plug. "There's always a first time, even for the best."

"Nothing wrong with it now, I'll bet, but wet plug or wires—man, that wind is sure picking up to blow."

"Maybe it's just wet." Gus placed a big thumb over the spark-plug hole and pulled the starter cord. "Ah, so that's it."

"What's it?"

"No compression," Gus said. "Likely it's valve trouble."

GUS removed the motor skirts, took the cover from the valve compartment, and peered inside with his flashlight. Darkness had now come down in earnest.

"Broken valve spring," he announced. "We're cooked."

"Cooked?" Elmer poised his lone oar. "What'll we do now?"

"We'll drift with the wind," Pete said, "until we hit shore, and bail like our lives depend on it."

"Mine does," said Elmer hollowly. "I can't swim."

"Put on a life preserver," Gus told him, "just in case. But we won't have to swim. We'll bail and stay afloat until we reach shore."

"Sounds wonderful," Elmer chuckled, "if we make it."

We'll make shore all right, Gus thought grimly, but what shore will it be? The way I've got this wind drift figured out, we'll hit a mile or so of cliffs that come down sheer to the water, with boulders sticking up. We won't be able to tell which way to dodge until we're close in—then it will be too late. These waves would batter us against the cliffs, even with life belts on.

"Well," he said, "I might as well tinker with the motor—maybe I can fix it."

"Nice way to get out of bailing, Gus," said Pete. "You can't fix a broken valve spring."

Gus couldn't open up the motor with spray coming aboard and into the works. He took a square of canvas they had brought along for a luncheon ground cloth, and with this covered the motor, his head and shoulders, and the lantern. Down below the gunwales on his knees, he could feel the skiff rise on the waves, fall sickeningly into the trough with a thud. Cascades of spray spattered on the canvas above Gus's head, and above the howling of the wind came the clatter of frantically wielded bailing cans.

Gus pulled the carburetor and re-

[Continued on page 280]

Power Barrow Hauls the Heavy Stuff

MECHANICS and HOMEBUILDING

Bulging with torque from a geared-down mower engine, this homemade truck trots uphill with loads of rock, sand or wood.

By Herbert R. Pfister

IT WASN'T laziness that prompted Herb Ernst to build this power wheelbarrow. It was the hilly site of his summer home. Building a stone fence around his property meant hauling load after load of heavy stones uphill from the edge of a not-too-near lake.

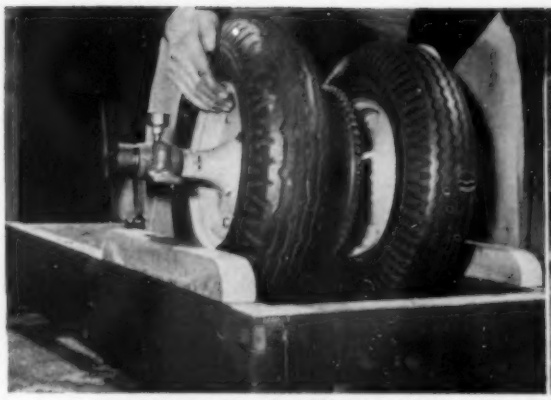
Herb Ernst is a New York City fireman, and his hobby is the machinist's trade. He looked through catalogues for something—anything—to ease that uphill haul and, finding nothing, he turned to his workshop and imagination.

Here's a list of the parts and materials that were rounded up and put to work:

- The engine and clutch assembly were

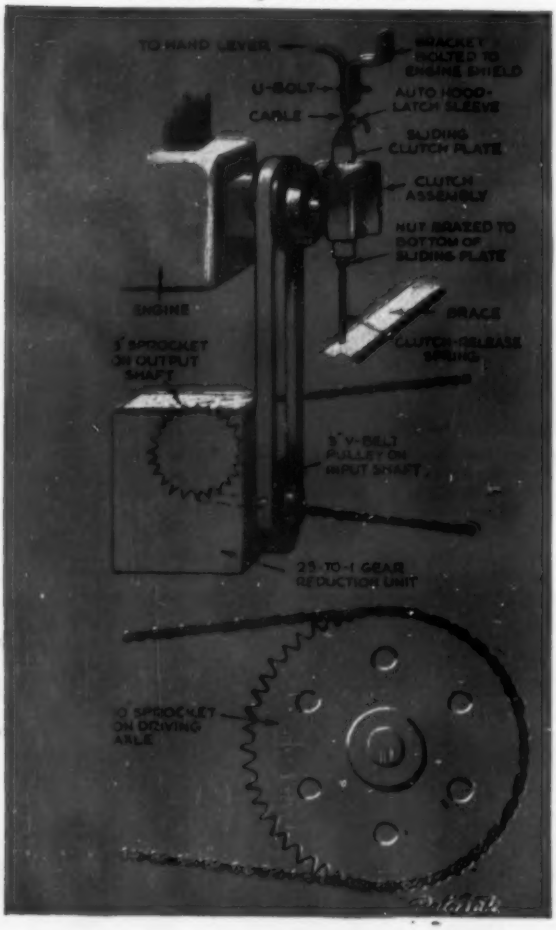
1 MASSIVE FRAME of 2"-by-6" pine was joined with glue and lag screws. Angle-iron braces reinforce all corners. Weight of heavy timber gives the driving wheels traction.

2 BEARINGS WERE REMOVED from 4.00 x 8 barrow-wheel disks, and 1" i.d. steel sleeves were welded in the bearing housings. Setscrews lock wheels to 1" drill-rod axle.



3 PILLOW-BLOCK BEARINGS, fastened with 9" bolts through frame, support axle. Two-by-two shims lower bearings so wheels don't protrude above top surface of frame.

4 TRAILING WHEELS are 3.50 x 10 (10" outside diameter of tire) mounted on ball-bearing casters. Top plate of caster is bolted to ¼" steel outrigger plate braced by angle.

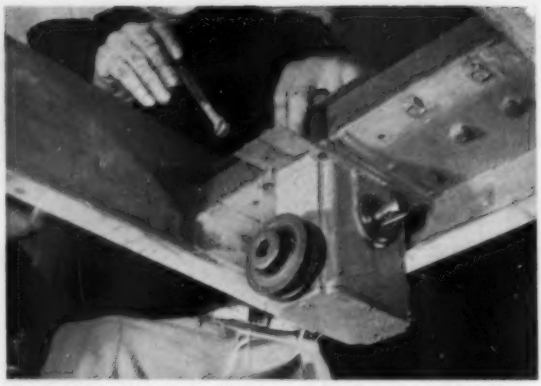


borrowed from a power lawn mower. Herb estimates change-over time at about 10 minutes.

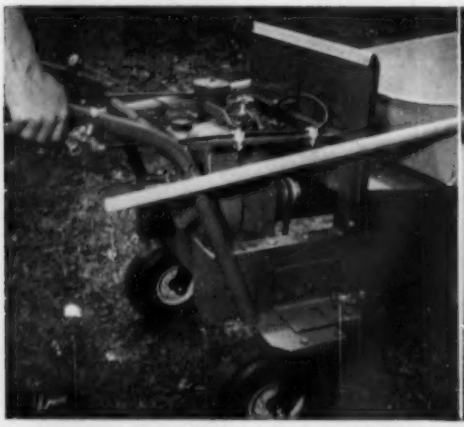
- A 3" V-belt pulley for the input shaft of the gear-reduction unit. The original pulley and clutch assembly were used on the engine shaft.
- A 3" chain sprocket for the output side of the gear-reduction unit and a 10" sprocket mounted on the axle between the driving wheels.
- Single roller chain and a master link to connect the two sprockets.
- A 25-to-1 ratio gear-reduction unit. The one used once rang the bells in a church tower. You can buy a similar unit, along with sprockets, chain and bearings, from Boston Gear Works, 480 Canal Street, New York City.
- A pair of 1" pillow-block bearings and 2' of 1" drill rod for the driving axle.
- Two 4.00 x 8 wheelbarrow wheels (16" outside diameter of tire).
- Two 3.50 x 10 pneumatic wheels on swivel casters.
- A wheelbarrow tray or bucket. The one used here is style M-11, made by Jackson Manufacturing Co., Box 9, Harrisburg, Pa.
- About 14' of 2"-by-6" pine for frame.
- About 18' of 1⅜" outside-diameter thick-wall steel tubing for handles and dumping arms.
- A hand-brake lever and flexible cable

from a motorcycle, for clutch control.
- A flexible throttle control from a Ford.
- A pair of motorcycle handle-bar grips.
- An assortment of steel plates and angles used to reinforce the frame and support the swivel casters.

From this pile of parts emerged the most powerful garden truck that I've ever seen. During the first test, the wheelbarrow toted three 200-lb. men up a 20-percent grade without loading the engine. The combined reduction ratio of the sprockets and gear-reduction unit totals about 83 to 1. It's difficult to estimate its horsepower, but there's no doubt that this wheelbarrow will haul anything you can put on it.



5 TRANSMISSION is 25-to-1 reduction gear bolted to underside of engine support. Shims between unit and engine support adjust belt tension by lowering the unit to tighten belt.



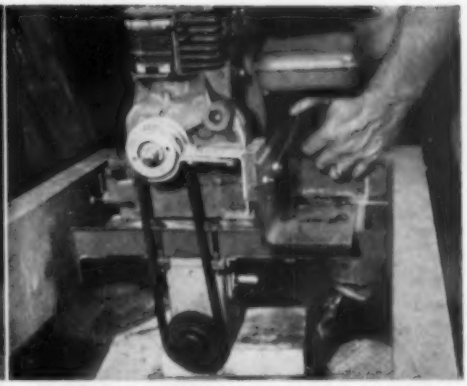
8 CLUTCH is controlled by flexible cable and hand lever clamped to handle bar. Squeezing lever sets barrow in motion. Throttle control is mounted on the left handle.

9 CLUTCH-RELEASE SPRING disconnects power drive when hand lever is released. Small nut to hold spring end (arrow) was brazed on end of sliding plate in clutch assembly.

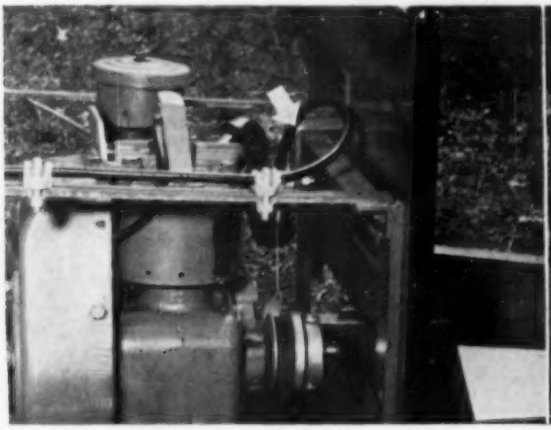
12 FOUR BOLTS FASTEN BUCKET to the dump base, a plywood rectangle. The long 4½′ arms are 1⅛″ steel tubing attached to the rim of the bucket with three U bolts on each side.

13 SOME DUMP. Large-size bucket, long arms on bucket, and stable wheelbase make it easy to handle oversize loads that would stagger a man with an ordinary wheelbarrow.

6 TRANSVERSE BRACE and adjustable bolt (arrow) prevent lateral shifting of gear-reduction unit while hauling heavy loads. Sprocket chain is cut to exact length, and then joined.



7 ENGINE is 1-hp., 4-cycle job borrowed from power lawn mower. Steel plate spreads weight of engine over a 2"-by-6" support. Angle at right of engine supports clutch assembly.



10 CABLE CLAMPS hold clutch-control cable against flexing. Bracket (arrow) positions the end of the cable over, and in line with, slotted sliding plate in clutch assembly.

11 FOLDING WEDGES, cut from two-by-four, support hinged dump base at slight angle to hold bucket nearly level. They flop over so the base can be used flat without bucket.

14 WITH BUCKET REMOVED, the barrow becomes a miniature flatcar for hauling wood, cinder blocks or rocks. Wood stakes fit in steel stake pockets on the front of the frame. END

New for the Handy Man

1. Cement Insulates Wires. You can insulate bare radio-circuit wires by coating them with a synthetic cement generally used as an adhesive. Just spread it on and let dry. Pliobond will resist chipping.

3. Collar Prevents Paint Mess. Slipping one of these plastic collars over the rim of a paint can makes it possible to stir or pour paint without getting any on the can. A straight lip on the collar is used to wipe off a fresh-dipped brush. Paint will flake off the collar as soon as dry.

4. Wall Anchor Uses Rubber. A turn of a key expands a rubber sleeve on this fastener for securing fixtures to a soft or brittle wall. It can also be used on metals, glass and ceramics. Neo-Grips come in two sizes for ¼″ or $\frac{3}{16}$″ screws. They can be easily removed for any redecorating.

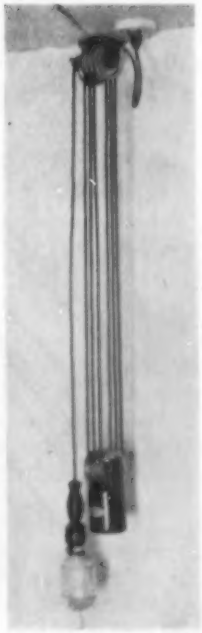
2. Sliding Doors Close Flush. These cabinet door tracks switch like railroad tracks to let sliding doors close flush. Each track has two rails. When the doors are closed, they rest on the front rail. Pushing either door at center pivots a switch (insert, lower left) that routes the door onto the rear rail. Slide the door back and press its outer end, and the switch swivels to bring it flush again.

5. Bracket Adjusts Ladder to Steps. Self-adjusting legs adapt your ladder to uneven heights—even steps. When you step on the first rung, the legs lock in place automatically, and can only be unlocked by hand. On stairways, the legs will take a 9½" riser. The Ladr-Levl, made of aluminum alloy, weighs five pounds and will hold a 1,000-pound load, the maker says. It can be transferred from ladder to ladder.

Further information about the products shown on this and the preceding page can be obtained from: 1. W. J. Ruscoe Co., 483 Kenmore Blvd., Akron, Ohio; 2. Mulray Products, Inc., 68 First St., New Rochelle, N.Y.; 3. Nomus Products, Inc., 6012 Wayzata Blvd., Minneapolis 16; 4. Rocket Devices Corp., 142 Liberty St., NYC 6; 5. H-B Industries, Inc., 1401 Middle Harbor Rd., Oakland, Calif.; 6. Robert A. Bernhard, 153 Anderson Ave., Rochester 7, N.Y.; 7. Reverso Products Co., 1333 39th St., Brooklyn 18, N.Y.; 8. Hykon Mfg. Co., 163 E. State St., Alliance, Ohio.

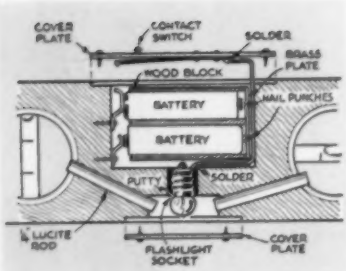
6. Chemical Mends Torn Pages. Books and magazines can be mended with this liquid chemical so that seams are unnoticeable. Bindry-Aid dries instantly and will not discolor the paper. Kit includes applicator.

7. Low-Cost Folding-Door Kit. Here's an inexpensive plastic folding door that you can install as a room divider or closet door in minutes. The Plastik-fold kit, which includes track, cornice panels, door handles and screwdriver, sells for about $10 (two-foot size) and up.

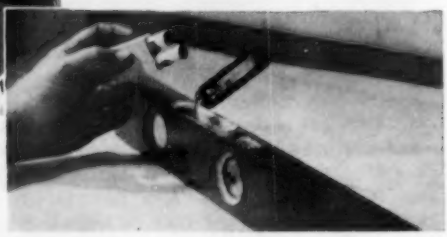


8. Reel Stops or Retracts Cord. Pull this cord to the distance you want and an automatic stop on the reel locks it there. Release the lock and a weight hauls the cord back up. Two standard models of the cord reel are available, with lengths of 25 or 50 feet of cord.

2 Ways to Improve a Spirit Level



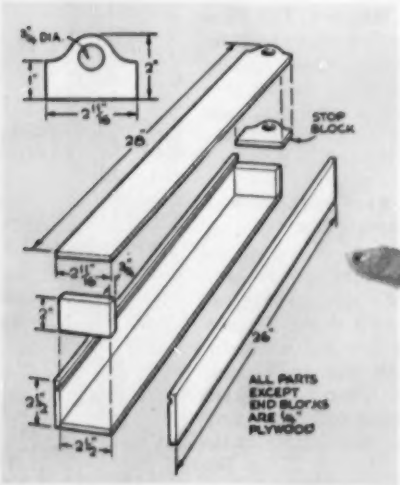
FLASHLIGHT ELEMENTS in the wood core of this level throw light where it's wanted, through transparent plastic rods. The on-off switch is at the top.



Build In a Light. You will have no trouble seeing the bubble in this spirit level in dark corners. A built-in flashlight throws illumination along a pair of ¼" clear plastic rods into the apertures.

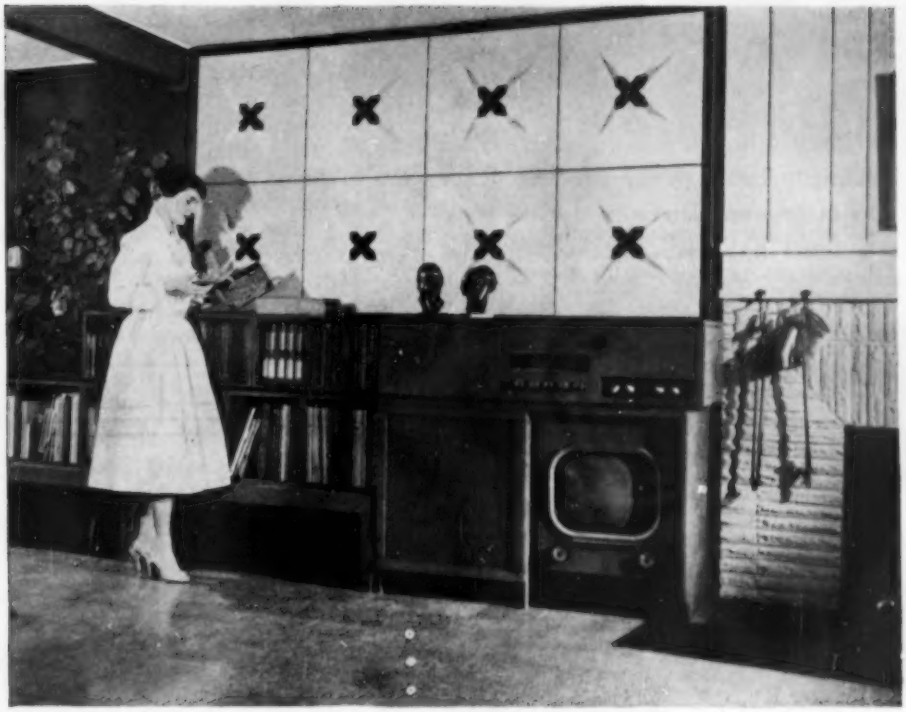
The level is mortised top and bottom to take the batteries and flashlight bulb. The batteries are set in a wood container bored and sawed to size. Thin spring brass is used for the contacts. The bulb socket is secured with wood putty and an insulated wire is soldered between the socket and the contact switch (a strip of spring brass attached to the upper cover plate). A sawed-off escutcheon pin, which passes through a hole in the upper plate, serves as the on-off switch button.

Quarter-inch holes are drilled from the bulb cavity into the level apertures for the acrylic plastic rods (Lucite or Plexiglas), which are sanded at the ends so that they will transfer a maximum amount of light. The cavity covers can be removed for battery and light replacements.—*J. N. Finn, Pittstown, N.J.*

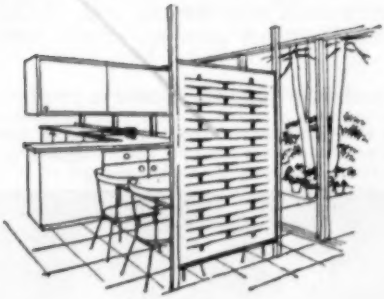


Build a Case for It. Spirit levels are fragile and shouldn't be tossed in a toolbox to take potluck with hammers, chisels and what-have-you. It pays to keep them in a protective case.

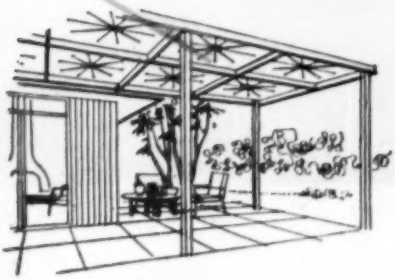
This one was made from strips of ¼" exterior plywood and two blocks of ¾" pine. The sliding top rides in ⅛"-deep grooves cut in the sides with a power saw. Dimensions are for a 2' level.—*David X. Manners, Norwalk, Conn.*



single panel used as room divider



patio sunshade creates unusual shadow pattern

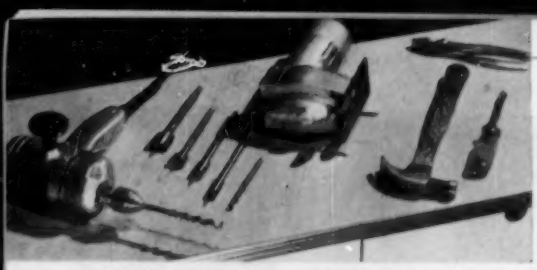


Make it with Moké

New 3-D Way to Decorate with Plywood

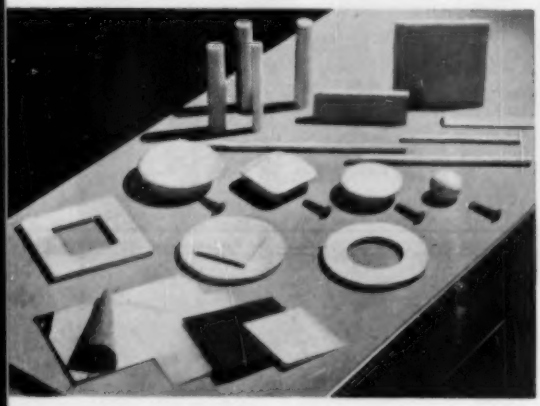
SLIP a fresh saber blade in your jigsaw—and there's a brand-new do-it-yourself craft coming your way. It's called Moké (rhymes with "okay"), and it's by far the coolest thing in weaving since the Panama hat.

Moke, or *max,* in plain English, though long out of the language, means "to weave." Add the French accent and you're weaving in plywood. And the re-



Simple tools make Moké

ASSORTED WOOD BITS spot holes in the plywood, a saber saw connects the holes to make weaving cuts, and pliers, a screwdriver and a hammer are used to insert the spacers.



Typical Moke spacers

DRAWER PULLS, dowels, and wood or plastic blocks are the spacers which give Moké its distinctive 3-D contours. For back-lighting, use glass-fiber cloth or thin fabric.

sult you get is an eye-filling, deep-sculptured effect for all sorts of panels that goes with other modern house furnishings like a painting by Picasso goes with a bowl of fruit and nuts.

Indoors, you can use Mokés for walls, overmantels, ceilings, screens or decorative panels. Light them from behind, and a whole room comes alive with softly glowing snow crystals, stars or geometric abstractions—projected in Technicolor, if you wish.

Outdoors, Moké is just as effective. Doors, shutters, fences and garden-house roofs are all made to order for Moké. You may not want a Moké sun tan, but the little woman will rave about the play of Moké light on a patio floor.

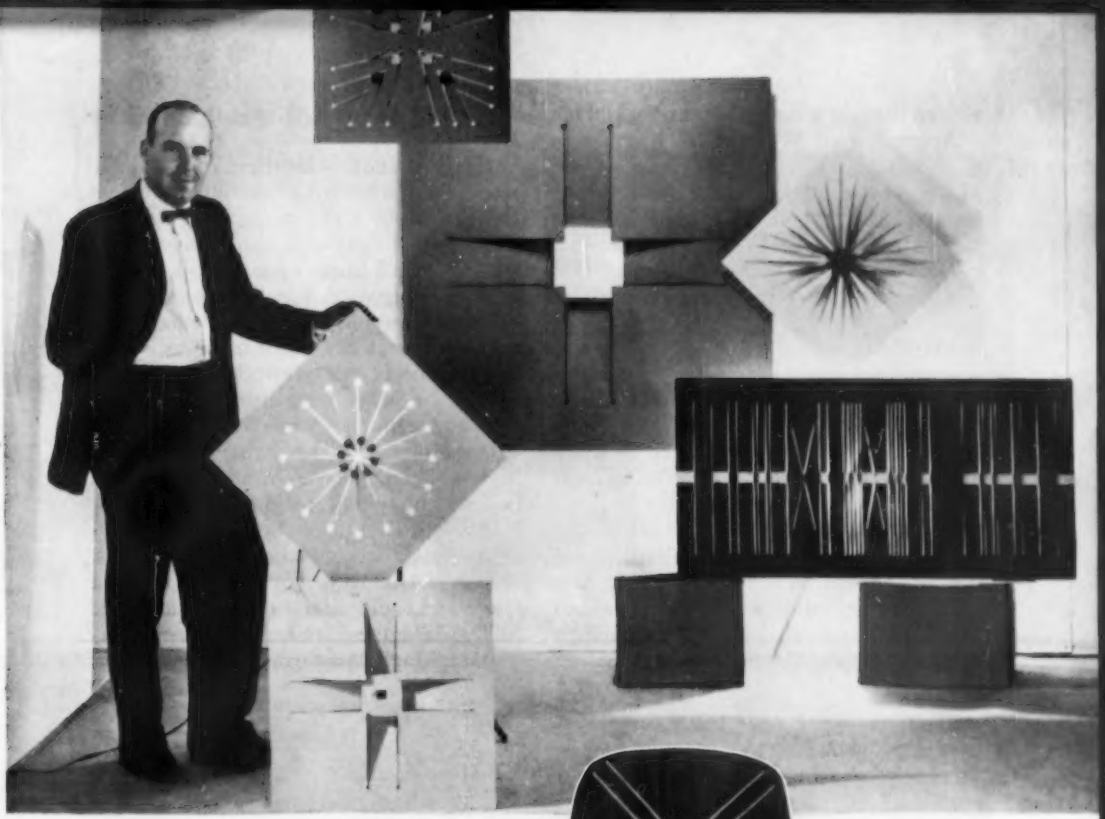
Moké is easy to make. Remember the little paper mats your kindergarten teacher taught you how to weave, right after the chocolate-milk break? She gave you a sheet of brightly colored paper with parallel cuts stamped through it, and you shuttled thin strips of equally colorful paper through the cuts.

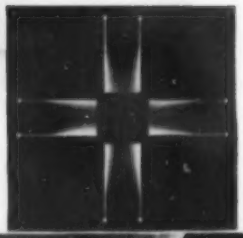
Moké is like that, but with plywood panels taking the place of paper background sheets, and dowels and wood or plastic blocks used for the weaving pieces. Sprung into cuts sawed through the plywood, the dowels and blocks spread the panel sections, giving your

Four easy operations give you a distinctive-looking Moké panel

AFTER CHOOSING YOUR DESIGN, pencil it on a thin sheet of plywood. Keep it well inside the edges of the panel.

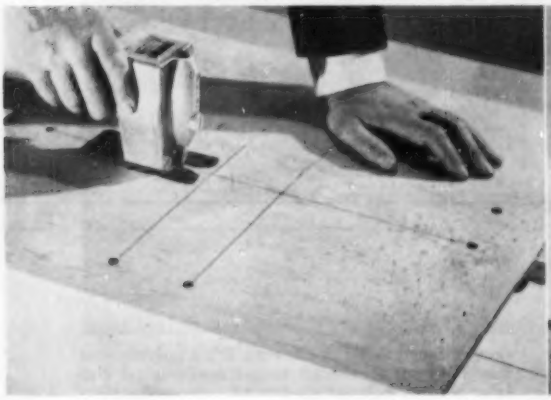
DRILL HOLES THROUGH THE PLYWOOD, as terminal points for your weaving cuts. They can be large or small, depending on the design.

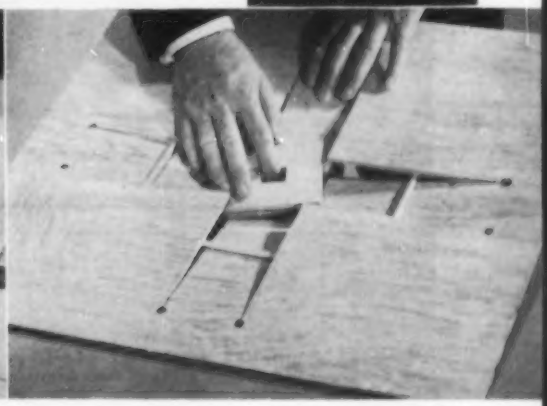




EYE-CATCHING SAMPLES OF MOKÉ are displayed by Whitney R. Smith, originator of the craft. Come up with a good design and half the job is done. Moké draws "oh's" and "ah's" from friends and makes you feel like a 20th century Michelangelo. Panels in the display above are both back-lighted and otherwise.

HERE ARE THE FINAL STEPS. Run a saber saw through the stock—a hand-held type is best, but you can use a deep-throated jigsaw. Slip the weaving pieces in place, using temporary dowels to space sections where necessary. Stiffen edges of small panels with a frame or backing strips. The finished panel, back-lighted, is at right.





woven designs a three-dimensional effect.

According to Whitney R. Smith, the California architect who dreamed up Moké, you can't go wrong on weaving interesting plywood panels if you follow a few simple rules.

First and most important, start with designs that don't call for sharp curvatures or intricate cutting. If you're in doubt about a design, make a preliminary mockup, using cardboard in place of plywood. Insert the dowels and blocks and study the play of light on the panel. Avoid a confusing hodgepodge of shadows—orderly tone patterns are a must with Moké.

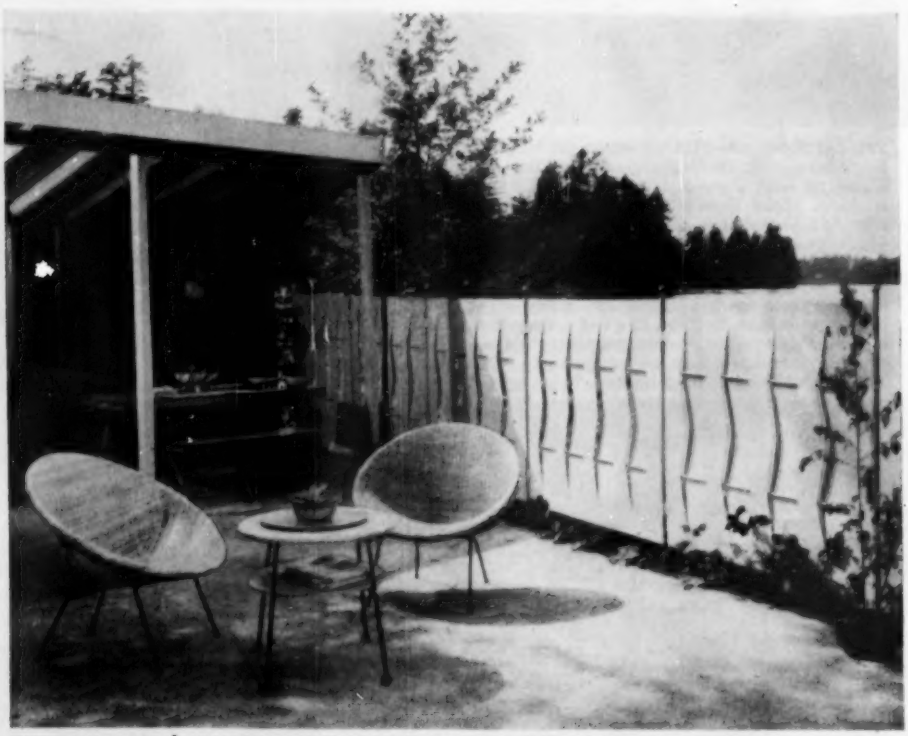
Try not to bend the plywood to the point of distortion. In general, all weaving cuts should be at least 10" long. You can't help warping small panels somewhat, but they can be brought back to shape by displaying them in a stiffening frame, or backing them up with reinforcing strips.

Paint or stain both the panel and the spacer parts before assembling them, if they are to be given contrasting finishes. Touch up the exposed panel edges later, using a small camel's-hair brush.

When weaving, handle the plywood carefully, prying up one section at a time. If one block must be interlocked with a number of plywood flaps, insert dowels or other temporary spacers before attempting to work it in position.

Planning to back-light an indoor Moké? Then place a translucent screen behind the panel to diffuse the light. For heightened dramatic effects, use colored glass-fiber or fabric filter screens.

The rest is up to you. Moké is only a few weeks old and nobody knows its full architectural and decorative possibilities. Maybe you can show them. END

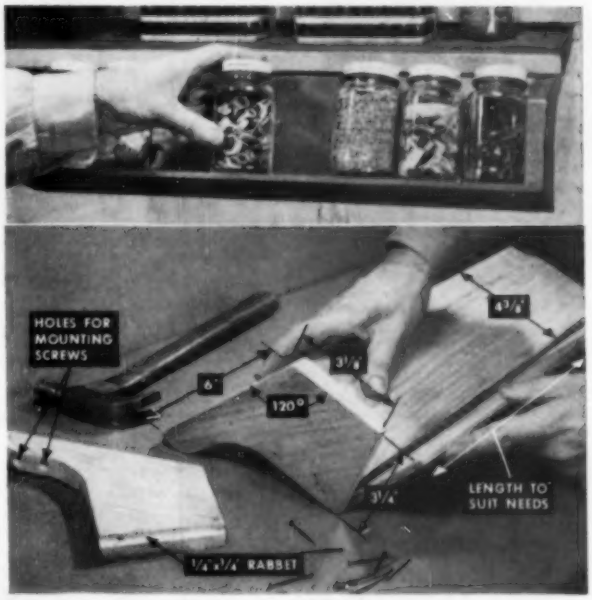


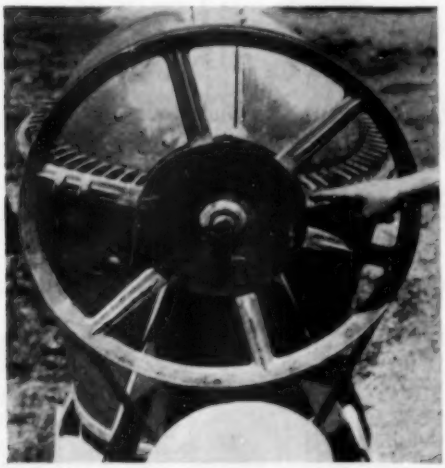
OUTDOORS, MOKÉ HAS MORE USES than Davy Crockett's musket. Here's a brand-new frontier, made of 4'-by-8' exterior sheets, with ¾" dowels laced through the cuts. It's a polychrome mural when a colorful sunset bounces off the lake behind it.

Sure Cure for Creeping Jars: Build a Sloping Shelf

ATTACH this sloping rack to the underside of a shelf to store small-parts jars safely. Resting at an angle of about 30°, the jars can't slip or creep off the rack, even when vibrated by machines or hammering.

Line up the jars you wish to store to determine the length of the back piece. Shape the ends and rabbet the bottom edge of each ¼" deep for a plywood bottom cut ½" longer than the back. Assemble the rack with glue and nails, and drive finishing nails into the back piece to space the jars and hold them in position when some are removed. Fasten the rack to a shelf with long screws driven through holes in the ends. *—Walter E. Burton, Akron, Ohio.*





Brace Repairs Cracked Pulley

A CRACKED spoke in a large cast-iron or aluminum pulley usually means an expensive replacement. But you can keep the wheels turning this way. Cut two steel disks (mine were ⅛" thick) large enough to extend beyond the crack, and rivet them to opposite sides of all the spokes. This false "hub" takes the load off the broken spoke.*—Ken Hadenfeldt, Storm Lake, Iowa.*

Vent Quiets Gurgling Funnel

To STOP the gurgling of liquid poured through a funnel, solder three ¼" metal strips at the spout joint. They provide a vent between the funnel and container.*—John Westhouse, Fort Erie, Ontario.*

Sponge Gives Fish New Outlook

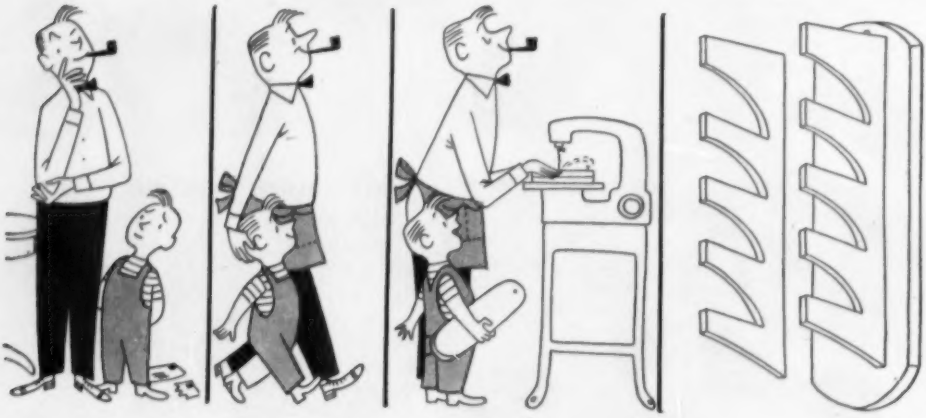
PUT a handle on a sponge and you have a simple device to clean the glass of a fish tank without getting your hand wet. Nail points driven through the wood will hold the sponge.*—Frank LaSaracina, NYC.*

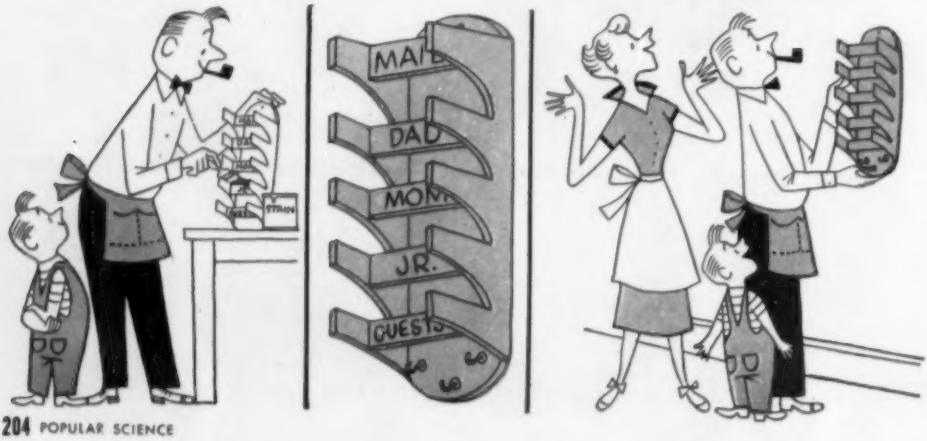
Coaster Spruces Up Doorknob

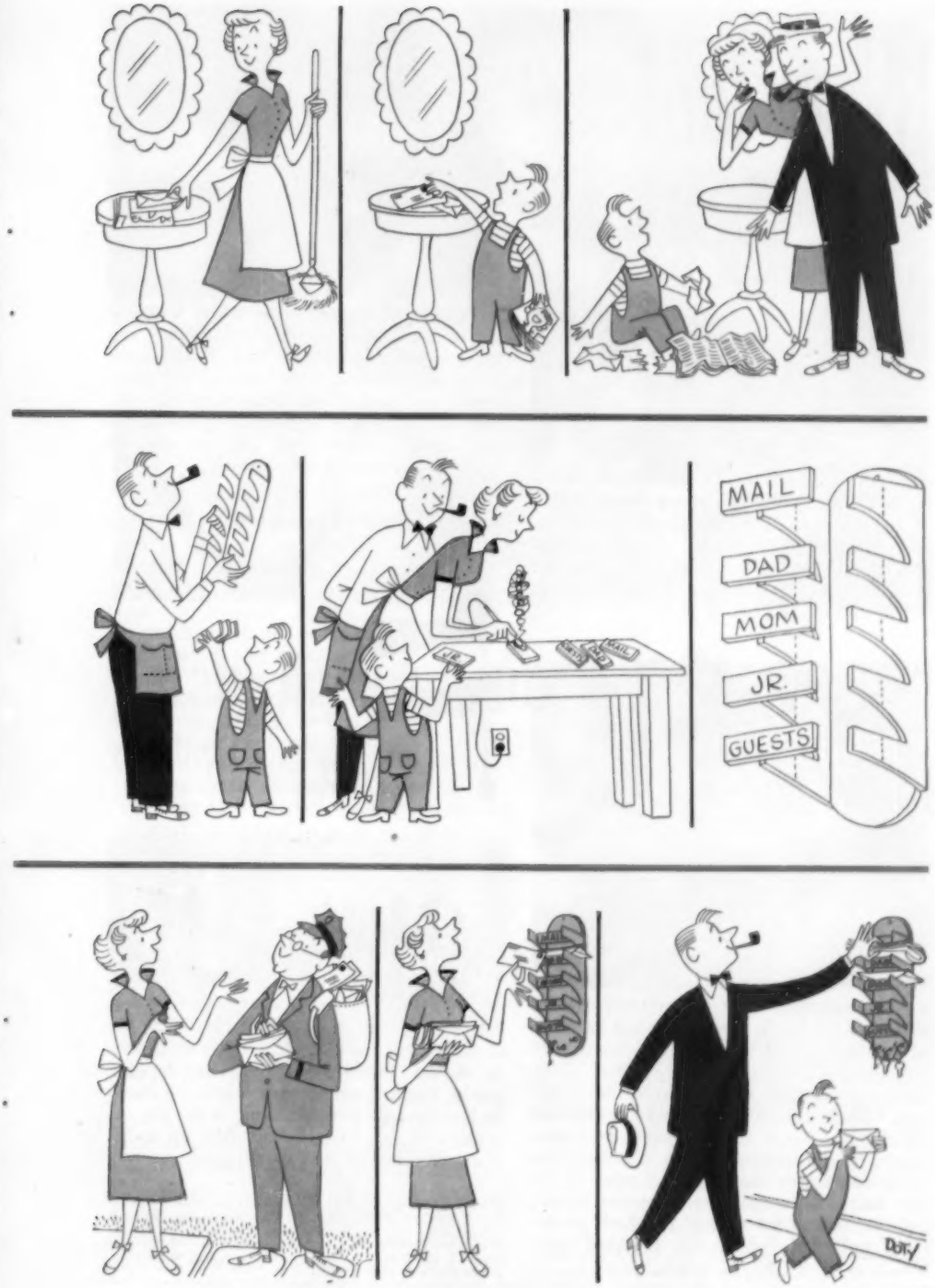
HERE'S one way to dress up a bare-looking doorknob. Cut a hole in a cheap leather coaster, slip it over the knob shaft and glue it to the door.*—Frank A. Javor, North Bergen, N.J.*

By Roy Doty

Wordless Workshop



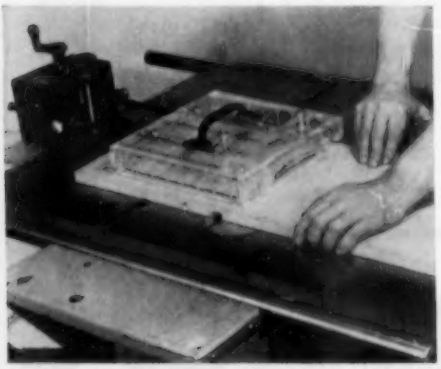




Next Month: Bills and books stay neat in a trick desk file

New Tools

1. Bit Fits Power or Hand Drill. A hex shank lets you chuck this auger bit into an electric drill as well as a hand brace. A positive grip is assured in both. You can get these bits in sizes ranging from 4/16″ to 7/16″ and in a variety of styles.



2. Transparent Saw Guard Adjusts to Work. Allowing full visibility, the circular-saw guard above adjusts to almost any cutting operation—common cutting jobs, grooving, angular work or compound cutting. Made of ½″-thick, shatter-resistant plastic, the guard raises, lowers and telescopes from a mounting base. This base can be positioned on the back and sides of the saw table, depending on cut to be made, and sits on metal plates attached to the table top. The guard can be used over blades of 6″ to 16″ diameters.

3. Meter Figures Rafter Size, Cuts. If you're building a roof, this "meter" can tell you the size rafter to use. It also indicates miter settings for cutting the plate notch and end miters with a radial saw. Just turn the wheel arrow to the pitch of the roof, from 1/24 to full, and an opening shows the necessary information.

4. Weight Drives Impact Tool. You don't need any air lines or electrical power to operate this new hammer. A sliding weight, rammed by hand against the chuck, drives the bit like a pile driver. Three sizes of weights can be mounted on the guide rod, and more than 40 tools fit into the chuck for chipping, drilling, riveting, seaming, cutting and other jobs.

5. Guide Trues Tap. With this tapping guide, you can true-thread a hole by hand. It handles all sizes of taps, with the exception of $\frac{7}{16}$″, from the smallest up to ½″. Hardwood holder comes with guide.

Further information on the tools shown on this page can be obtained from: 1. Irwin Auger Bit Co., Wilmington, Ohio; 2. Brett-Guard Co., 5 W. Sheffield Ave., Englewood, N.J.; 3. De Walt, Inc., 3046 Fountain Ave., Lancaster, Pa.; 4. E. V. Nielsen, Inc., 132 Broad St., Stamford, Conn.; 5. Griffith Tool Co., 237 E. Crescent, Elmhurst, Ill.

Rotary Jigsaw Routs and Shapes

THIS rotary jigsaw flies through wood like a whirling dervish. Instead of a blade, it has a spinning bit that looks like an ordinary twist drill but is designed to munch through heavy materials sideways.

Brand-new, it's being put on sale as you read this. Here's how it works:

A high-speed motor (24,000 r.p.m.) drives a small-diameter bit with an especially long spiral that increases its side-cutting action. You can begin anywhere in the middle of the largest sheets, and the saw will start itself. You can go as far as you like, with no limit to saw travel. You can guide it through intricate contours in woods up to 1" thick, plasterboard, wallboard and plastics.

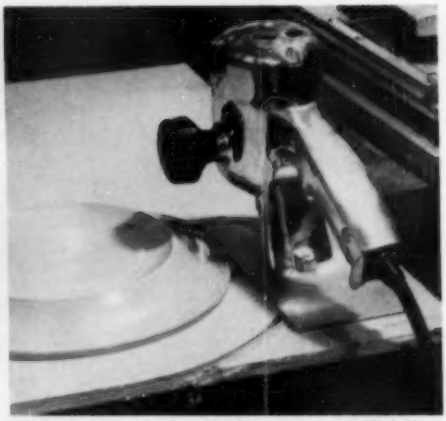
How do you keep a rapidly whirling bit from skittering off like a toy top? The secret is a short guide pin that rides in the saw slot just behind the bit. It

HERE'S THE PIN, set just behind the bit, that keeps the cutter from wandering. By pivoting the pin against the sides of the cut, you can steer the bit in any direction. The bit resembles a twist drill but has an extra-long spiral.

follows the bit like a rudder, preventing it from getting off course and providing a pivot point for you to steer the saw.

Substitute a circular base plate for the square-edge one and the saw becomes a router. Mount it in another accessory and it becomes a small bench shaper. By using interchangeable cutters, you can do most of the routing and shaping jobs that the big machines do—cut dadoes for shelves, rabbets for strong drawers and cabinets, decorative inlays and scallops.

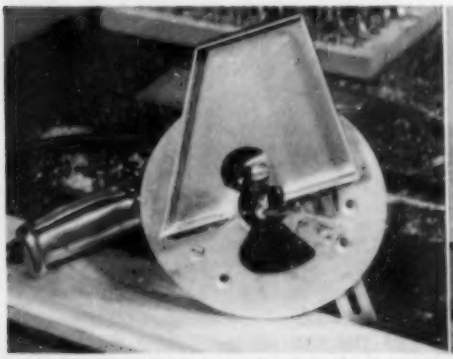
The jigsaw weighs only about four pounds, so you can carry it easily from job to job. Called the Routo-Jig, the basic Porter-Cable tool will sell for around $50.



FOR NEAT CIRCLES, the base plate will follow the edge of any round guide you have—a can, pail, jar cap or, as here, a dinner plate.

WITH ROUTER BASE screwed in place of the straight guide, you can cut grooves, mortises, and intricate designs to any depth in the face.

DUPLICATE CUTS are quickly made by riding the edge of the first piece, clamped on top as a guide. Bit sizes permit cuts up to ½" wide.



TO CUT A RABBET, you simply clamp on this adjustable edge guide and run it along the side. Other bits round edges, cut reeds and flutes.

BENCH ATTACHMENT converts saw to stationary shaper. Using the guide fence, you can cut accurate matching joints and edge shapes.

Transistor Portable Gets All the Stations

By Howard G. McEntee

TAKE the average portable radio into a coach on the lower level of New York's Grand Central Station, and it's as silent as a well-staffed tomb.

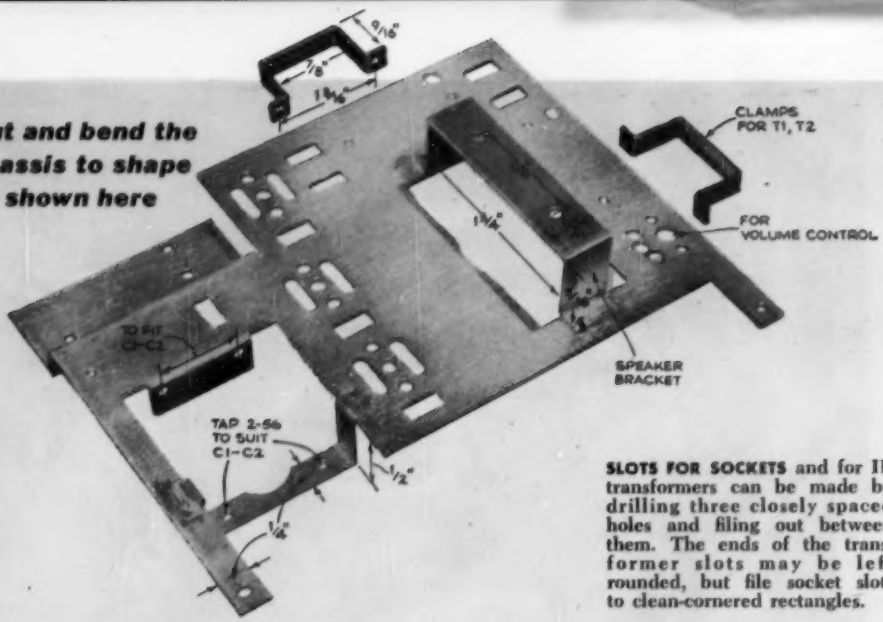
But this spunky midget, flea-powered by an 11-volt battery and sparked by eight tiny transistors, pulled in five stations from my seat in the 5:19. In the suburbs, 25 miles from transmitters, it doesn't even know it has left town.

It gets not only the major kilowatters, but the small ones too, and separates them all beautifully. Tone is good, volume more than the midget speaker can take, battery life amazing. This is one portable you can use, and use, and use.

Why transistors? These midget marvels are already giving tubes a tough battle on the following counts:

- Having no filaments, they need no fast-draining "A" battery.
- They require only low voltage, instead of the 67½ or 90 volts tubes do.
- Transistors last indefinitely.
- Being rugged and non-microphonic, they can rough it in portable use.
- Small size and modest battery demands make them a natural for compact equipment.

The circuit used in this set was de-



Cut and bend the chassis to shape as shown here

SLOTS FOR SOCKETS and for IF transformers can be made by drilling three closely spaced holes and filing out between them. The ends of the transformer slots may be left rounded, but file socket slots to clean-cornered rectangles.

These miniature parts cram a superhet set into small space

A,B,C,D,E: 8 matched RD2517A transistors
IFT1, IFT2: Interstage IF transformers
IFT3: Detector IF transformer
Loopstick: Special RE13019
T1: Input AF transformer
T2: Output AF transformer
T3: Oscillator coil RE13021
C1, C2: Superhet tuning condenser (R/C273)
Speaker: Best Mfg. Co. 2 ¾P
D: Diode detector (Raytheon 1N295)
C3, C5, C6, C7, C11: .01 mfd. ceramic (CRL DM103)
C4: .0005 mfd. mica
C8, C9, C20: .1 mfd. paper (Aerovox P82)
C10, C12, C14, C19: 2 mfd., 6-volt electrolytic (Barco)
C13: .005 mfd. ceramic (CRL DM502)
C15: .002 mfd. ceramic (CRL DM202)
C16: .01 mfd. paper
C17: 25 mfd., 6-volt electrolytic (Barco)
C18: 25 mfd., 25-volt electrolytic (Barco)
R1, R7: 1,500-ohm, ¼-watt carbon
R2, R3, R11: 3,300-ohm, ¼-watt carbon
R4, R6: 470-ohm, ¼-watt carbon
R5: 1,000-ohm, ¼-watt carbon
R8: 510,000-ohm, ¼-watt carbon
R9: 5,000-ohm subminiature variable
R10: 100,000-ohm, ¼-watt carbon
R12, R13: 330-ohm, ¼-watt carbon
R14: 100-ohm, ¼-watt carbon
SW: D.P.D.T. slide switch
8 Subminiature 5-prong sockets with mounting clips (Cinch 2H5)
2 Clips for loopstick (H.H. Smith 834)
1 Battery holder (Acme No. 9)
1 VS-088 alkaline battery (RCA)
All parts available from Federated Purchaser, Inc., 1021 U.S. Rt. 22, Mountainside, N.J.

veloped by the Radio Development and Research Corp. of Jersey City, for their own RD 2517A NPN transistors. Since these have three elements, the rig is similar to a superhet using triode tubes. It has a mixer coupled to the loop, two IF stages, a crystal diode detector, and three AF stages, the last one a push-pull type.

All the transistors except that used as the oscillator are in what is known as a grounded-emitter connection.

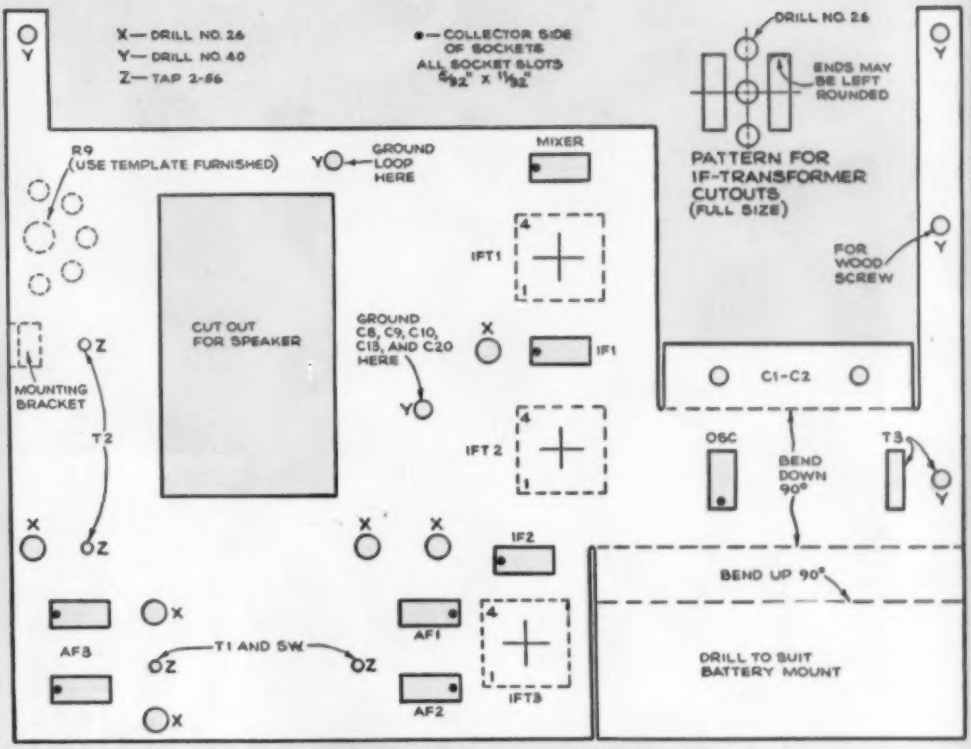
Battery by the slice. The alkaline battery costs about $2. It comes in the form of a plastic sleeve holding 15 cells. Each puts out about 1.4 volts when new, so you cut one off for use as B1 and seven for B2.

This leaves only seven replacement cells for your next battery change, but with a fresh cell for B1 and only six for B2 (a coin or metal clip being used to fill the gap) the set works almost exactly the same. It still gives reception when B1 is down to .8 and B2 to 5.6 volts.

By using a slightly bigger case, you could substitute AA pen-size flashlight cells. The special hearing-aid type will give well over 100 hours of use.

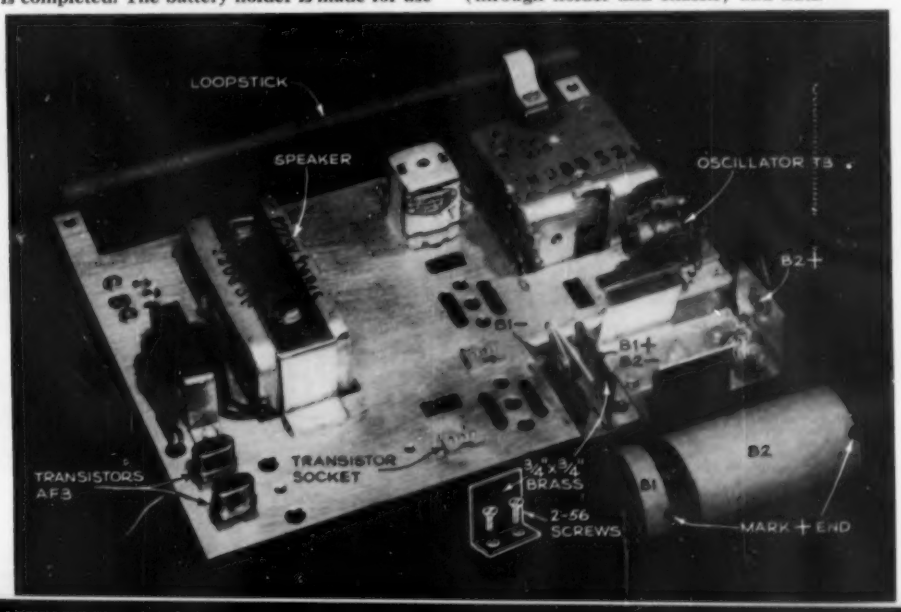
Transistors come matched. Although the set will work with the RD 2517A transistors in any position, best results will be had from a matched set tested and coded for each place in the circuit. Such a set is available at $20.

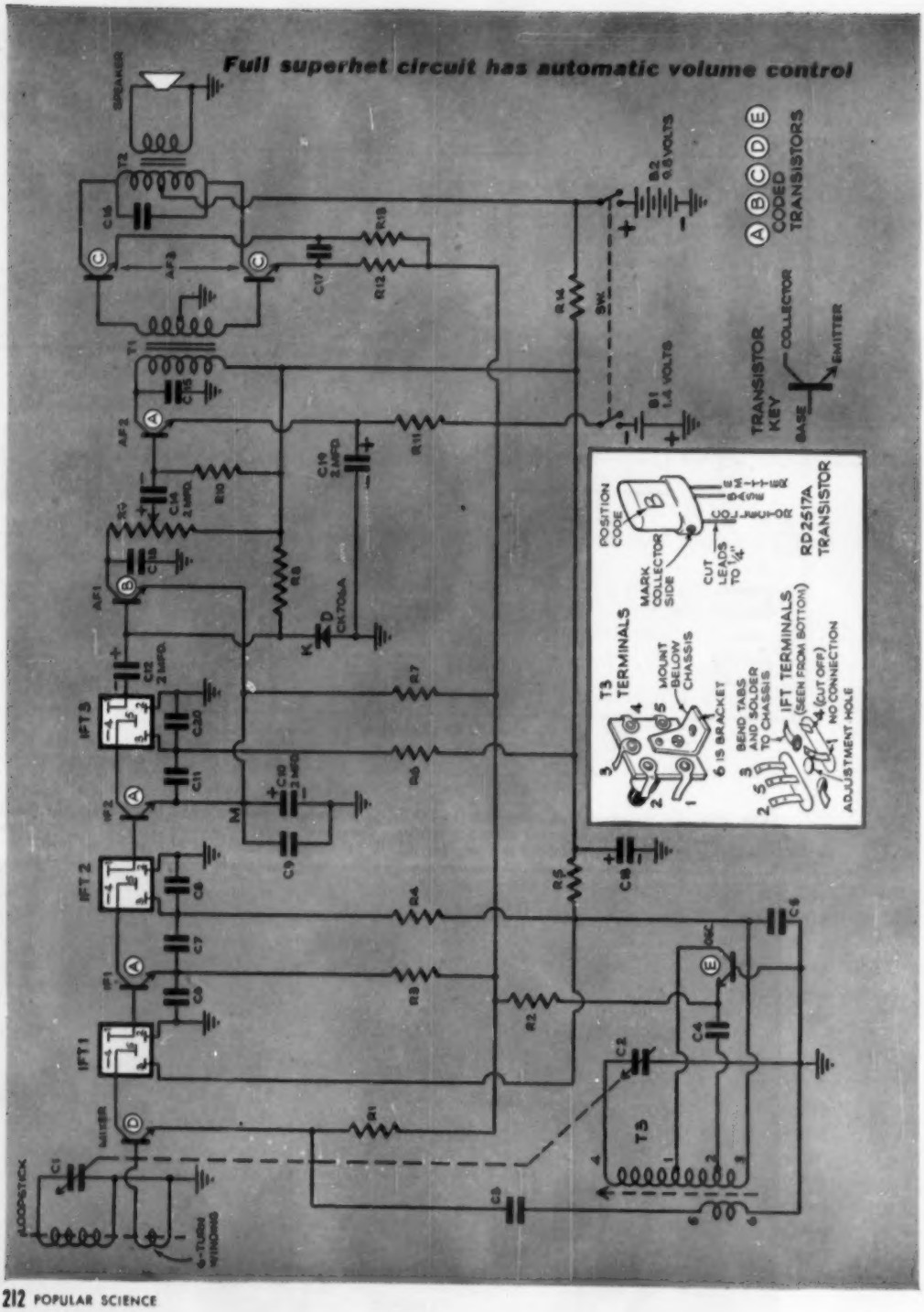
The collector lead is the single one, as shown in the drawing. To avoid putting any of the transistors in backwards, spot



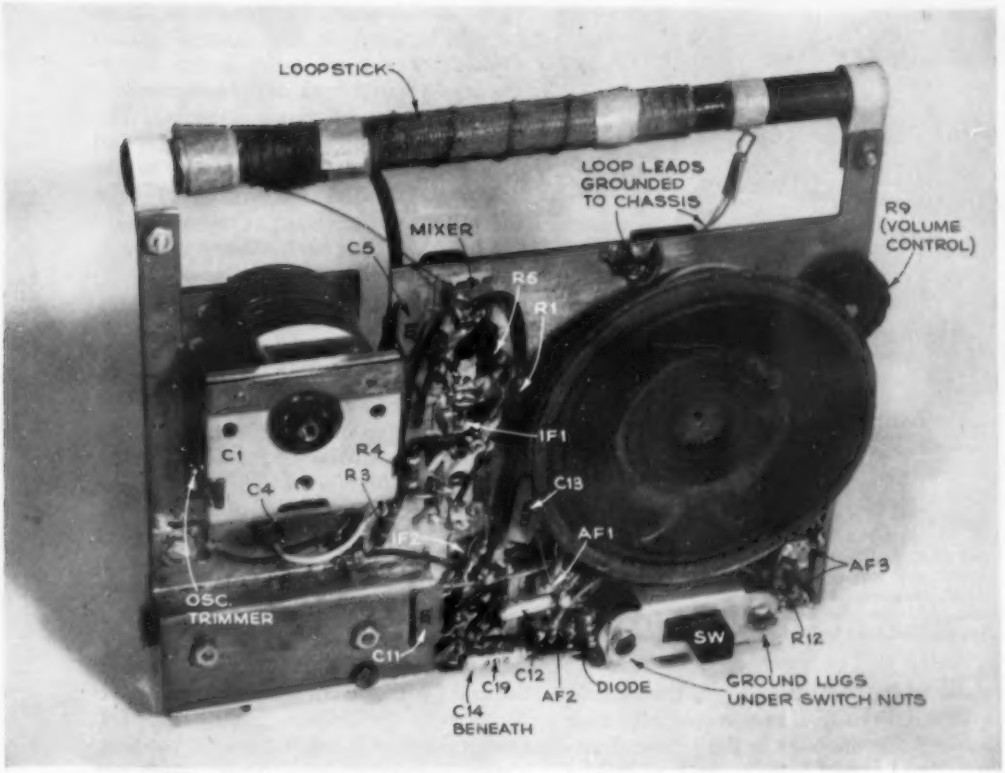
CHASSIS LAYOUT (BATTERY SIDE) FULL SIZE
(20-GA. BRASS)

LEAVE OFF the speaker and loopstick (after a trial fitting as shown here) until all other wiring is completed. The battery holder is made for use in models; make a small bracket for the common contact as shown and mount it with screws (through holder and chassis) and nuts.





Full superhet circuit has automatic volume control



CHASSIS IS NOTCHED around the loopstick to prevent loss of sensitivity. Use ¾"-long screws to mount T1 and the on-off switch (T1 is on back of chassis). Set the switch off the chassis with 7/16"-long bushings. Put a lug under each switch ear as a ground tie.

the collector side of each with a dot of red nail polish or paint.

Some of the other midget parts may be hard to get. You can order them as a kit, too, buying the more common parts locally. A complete kit, including the transistors and battery, but not the case, is available for about $50.*

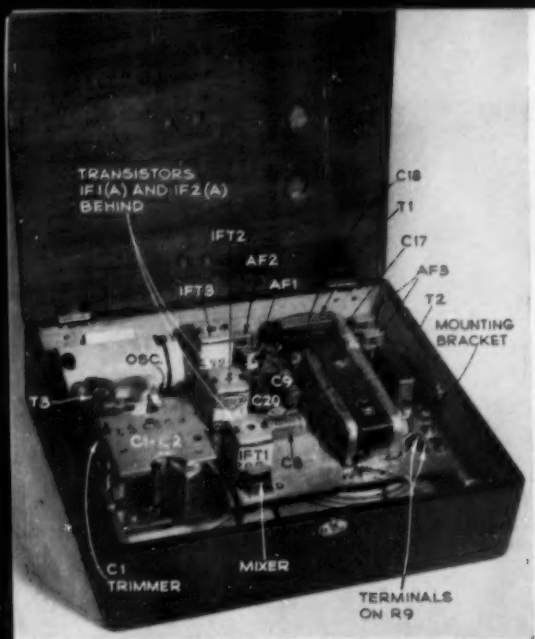
Unless you have experience in wiring midget parts, better not tackle this compact job by yourself. Some parts must be tucked under others, leads kept short, and joints made with a minimum of solder. Aligning the set calls for some know-how or a signal generator. Aside from these points, the receiver is easier to build than an equivalent tube set.

Cutting the chassis. Sheet brass of about 20 gauge is recommended, as you can solder ground connections directly to it. Trace the full-size layout from page 211 on the metal with carbon paper. Prick-punch the centers of the holes and IF transformer locations. Use the separate pattern given to lay out the transformer cutouts on these centers.

Cut out the loopstick, speaker and tuning-condenser openings. Bend the condenser mount and battery shelf as shown in the drawing. Spot only the shaft hole for R9; lay out the other holes with the template provided.

Mounting the parts. From ¼"-wide brass strip, shape mounting brackets to hold on the AF transformers. These are screw-mounted. Bend a tiny right-angled chassis-mounting bracket, a U-shaped one for the tuning condenser, and a ½"-wide one for the speaker. Solder all

*Federated Purchaser, Inc., 1021 U.S. Rt. 22, Mountainside, N.J.



THE CASE may be wood or plastic (metal would shield the antenna). This one, of cigar-box wood, measures 1⅜" by 4¾" by 5 9/16" inside. Lid dimples clear protruding screws. A handle could be bolted to the top edge.

of these brackets directly to the chassis.

Position the IF transformers with their 1 and 4 terminals as in the layout drawing. Bend down, clip short, and solder the mounting lugs to the chassis, using a hot iron as briefly as possibly so that heat will not affect the plastic.

Push in the transistor sockets and force rectangular retaining clips over them from beneath. Since the sockets have five lugs but the transistors need only three, pull out two lugs near one end of four of the sockets (mark this, the collector end, with red paint). Pull only one of the extra lugs out of the IF1, IF2, oscillator and AF2 sockets; the other is useful as a tie point.

When mounting R9, insulate its prongs where they pass through the chassis, using cellophane tape or spaghetti.

Wiring the set. Much of the wiring can be done with the pigtails attached to the parts. Slip spaghetti on bare leads. There are three electrolytic condensers that must be insulated from the chassis. Wrap these (C12, C14 and C17) with tape so that their cases cannot touch.

A double-pole, double-throw slide switch is used in the battery circuit (don't try a single-pole switch in the common ground lead, or the batteries will discharge through the transistors). The ungrounded battery leads go to the end lugs and the circuit leads to the center or switch-arm lugs. Both unused lugs at the other end are used as tie points.

Check and recheck. When wiring is completed, better check every connection at least twice.

If you have a low-range milliameter, connect it first in series with B1, then with B2. It should read about 10 ma. in both cases with the set on; if the reading is much different, turn off the set at once and check connections.

Aligning the circuit. The tuning-condenser trimmers and the oscillator core are best adjusted with a signal generator. If you haven't one, connect a low-range DC voltmeter from point M in the circuit to ground. It should read about .1 volt with no signal.

Tune in a station near the high end of the dial (with the condenser plates about 20 percent in). Then adjust the C1 (mixer) trimmer for the lowest reading across M and ground. Next, touch up all three IF transformers. These come tuned close to 455 kc. and should require only slight adjustment.

Now tune in a signal at the low end of the dial and adjust the core of T3, while rocking the tuning dial back and forth, to obtain the lowest meter reading. Then return to the high-end signal and reset the C1 trimmer as necessary.

Properly aligned, the set should tune from about 530 to 1,650 kc. If it doesn't reach the high-frequency stations, readjust the trimmer of the oscillator section. If it will not pick up low-frequency stations, bring them back on the dial by pushing the core of T3 farther in.

Finishing touches. The case shown is of cigar-box wood, with glued butt joints rounded off outside. One end is slotted for the volume control and the front for the switch. A finished wooden case, ready for use, is available for $2. END

KEEPING THE Home SHIPSHAPE

COVER HOT-WATER PIPES placed where the housewife might accidentally brush against them with her arm. Garden hose split lengthwise along one side does the trick. The rubber will also provide some insulation and catch drippings if the pipes sweat excessively.

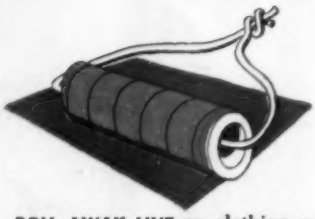
HOOKED OVER A DOOR, an old umbrella with wooden shaft and crooked handle makes a handy holder for freshly ironed clothes. Remove ribs and covering. Then screw cup hooks along the shaft.

A GARDEN-HOSE RACK can be made by nailing three pieces of tire casing to a board hung on the cellar wall. The rubber retainers are easily bent back to coil the hose in place.

SEAL A LEAKY RADIATOR with iron cement. If the leak is in a tight spot, say between the leaves, force the packing in with a piece of soft wire. A twist of the wire ends will hold the cement in place until it has time to harden.

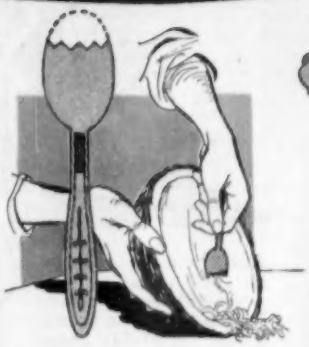
Please turn the page for more home tips

More Home Tips



ROLL AWAY LINT on clothing or upholstery. Use the wooden grip of a package handle wound with cellophane tape, tacky side up. Bend up the wire as shown.

THERMOSTAT unsightly? A fancy shadow box will cover it. It's hinged to the wall at one side so you can swing it open in order to reset the instrument. Top and bottom of the box are open for air.



A DANDY COCONUT scraper can be made from a spoon. Just file a row of teeth across it.

TREAT A FLAGSTONE FLOOR with a coat of clear penetrating floor sealer to ward off stains and highlight its color. A layer or two of wax spread over the sealer makes a good follow-up protective coat.

TO SPATTER-PAINT A FLOOR, strike the brush sharply against a stick. A lightly filled brush held about a foot from the floor produces small spatters, a full brush held three feet high, large spatters.

PLASTIC DISHES STAINED? Colorado A & M College suggests soaking in ¾ cup bleaching solution, ¾ cup baking soda, one cup vinegar for five minutes. Then wash and rinse.

Relining Brakes Is Simpler Now

You can treat your baby to a set of factory-lined brake shoes. It's a take-apart-and-put-together job that you can handle yourself.

By David X. Manners

WHEN adjustment doesn't help your brakes, reserve half the following Saturday for a relining job—that's all it should take. Even though you've never tackled a brake job before, the photos and instructions on the five following pages will show you, step by step, how to do a professional job.

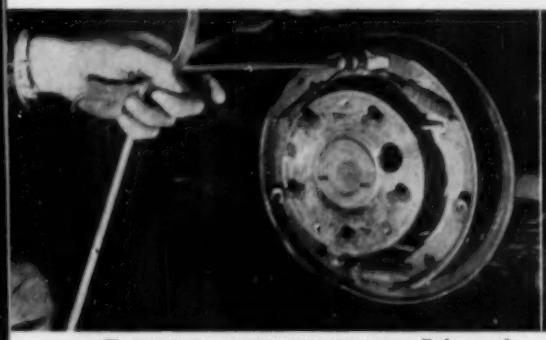
Easiest to work on are Ford and General Motors cars, which require no wheel puller to remove the rear drums. The relining operation is about the same on Chrysler cars, on all the independent lines and on Chevrolets prior to '51s, except that a wheel puller is needed. The adjustment of some differs slightly, as shown on page 222.

A wheel puller adds about $10 to your tool cost and may cancel out the saving gained by doing the job yourself. You may be able to borrow a puller from your auto-parts dealer on a Saturday afternoon and eliminate this extra if you promise to return it Monday morning.

Please turn the page for detailed instructions

1 YOU HAVE MOST OF THE TOOLS needed for the job in your car's tool kit, but these two will help: Brake-spring pliers (cost about $2) will save tugging at brake-shoe springs, and the adjusting tool at right (75 cents) is easier to handle than a screwdriver.

2 REMOVE THREE DRUM NUTS after jacking up the car and blocking it safely. These nuts, usually three, are located between the wheel lugs and are visible after the rear wheels are removed. Some cars have square-sided washers that can be turned off with pliers.

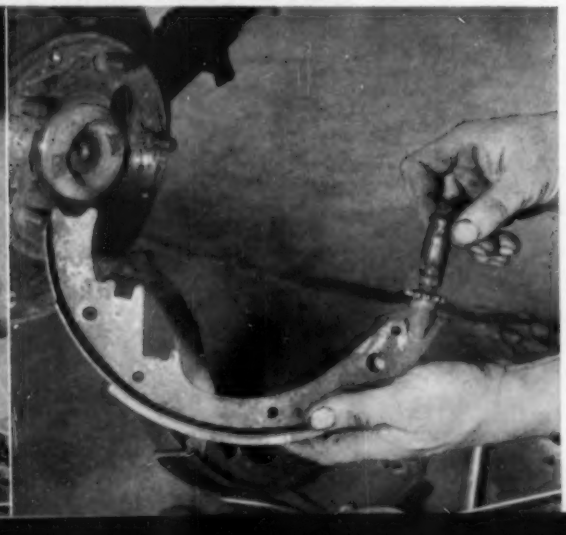


5 SNAP THE RETAINING SPRINGS off the anchor pin with the notched end of the brake pliers. Springs can be pulled off the anchor pin with regular pliers, but you'll have to tug a bit to stretch them out of the grooves.

6 SLIDE THE GUIDE PLATE off the anchor pin. Note how the shoe ends fit against the head of the pin. Later, when replacing shoes, you may have to move the pin up or down in its slot to center them against the drums.

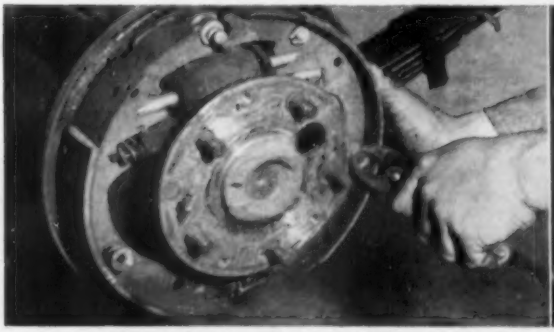
9 LOWER THE SHOES and bring them together to slacken the adjusting-screw spring for easy removal. Leave the parking-brake spreader arm and short compression spring (arrow) in place beneath the wheel cylinder.

10 SLIP THE ADJUSTING SCREW off the bottom of the shoes, noting how it fits on the webs. Dab grease lightly on the threads and under the end cap, and turn the screw all the way into its cylinder.



3 DRUM SHOULD COME OFF EASILY. If it sticks, tap it lightly on all sides with a hammer. If it still won't yield, see if the parking brake is off and back off your service brakes by turning the adjusting screw. When it comes off, brush fine dust off the brake assembly.

4 IF THE DRUMS ARE DEEPLY SCORED, take them to a brake shop for refinishing (about $1.50 each). They'll use a drum lathe like the one shown above. If the drums need turning down, buy oversize linings to compensate for the metal that is removed.

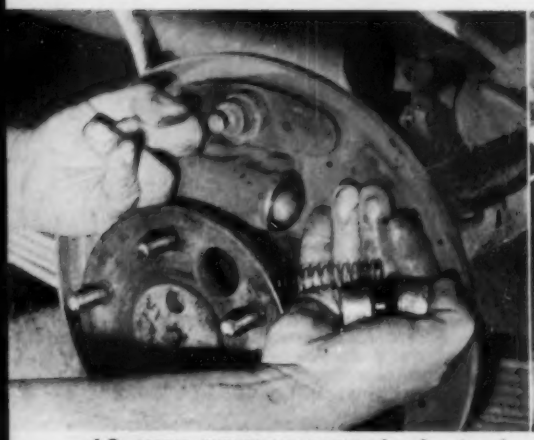


7 TURN THE SLOTTED CUP WASHERS with pliers until the slots line up with the T heads of the hold-down pins. Remove washers and springs, and push the pins through the carrier plate. This frees the shoes.

8 SPREAD THE SHOES OUTWARD to clear the ends of the wheel-cylinder links (arrow), then pull them toward you. Make a mental note of how the ends of the plunger links fit into recesses in the web of the brake shoe.

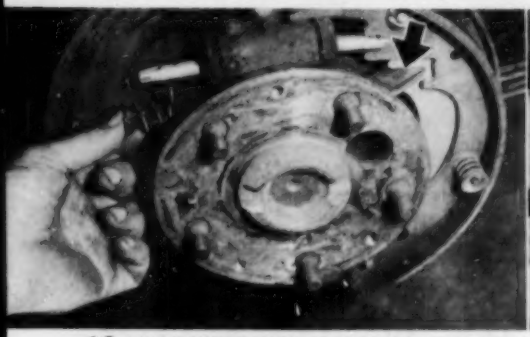
11 UNHOOK THE CABLE from the parking-brake lever. Pull the cable cap with pliers while pushing the lever back against the spring until the cable can be slipped through the narrow opening at the top of the cable-cap socket.

12 REMOVE THE PARKING-BRAKE LEVER. Spread the split retaining washer holding the pivot pin on the shoe web and force it out of the groove. Install the lever on the web of the relined brake shoe, using the same split washer.

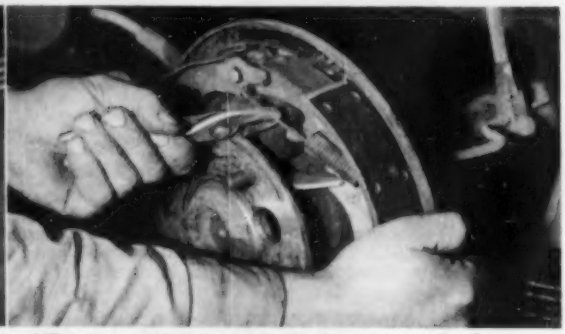


13 AVOID FUTURE HEADACHES by cleaning the wheel cylinders now. Remove the end boots and push the rubber cups and pistons out. Wash grease off your hands with soap and water before handling the parts. If the cups are worn or mushy, buy a new set (39 cents).

14 SCRUB THE CYLINDER WALL with a bottle brush dipped in alcohol and wash the parts in alcohol. Then dip the parts in brake fluid and replace. The dished side of the cups faces *into* the cylinder, the flat side of the pistons fits against the cups. Bleed the lines later.



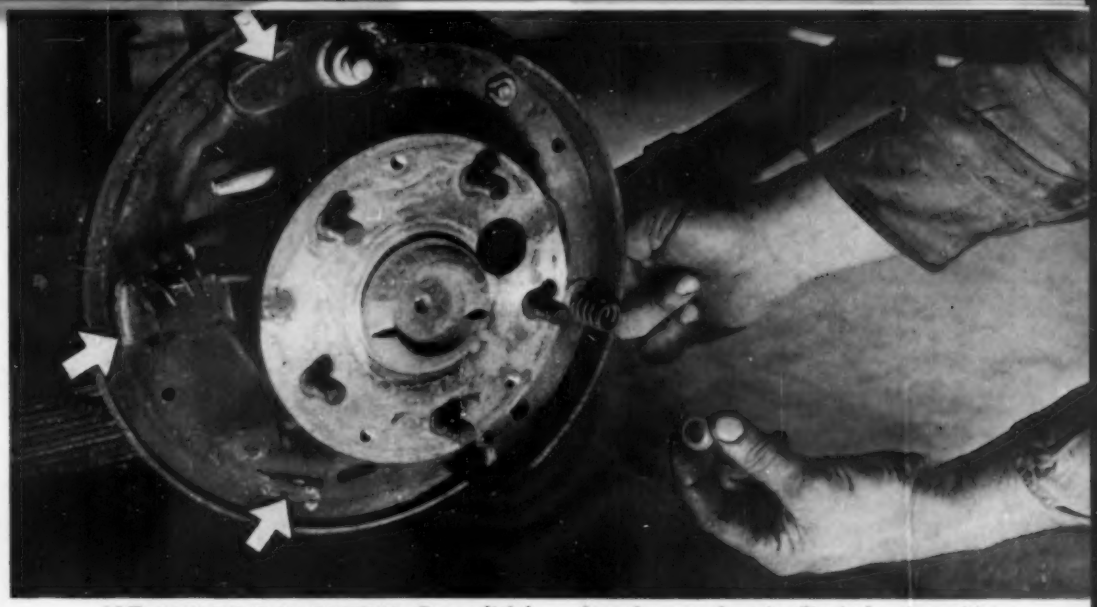
16 PRESS THE PARKING-BRAKE SPREADER ARM into the notch on the parking-brake lever (arrow). Hold the primary shoe against the spring end and secure it with the hold-downs.



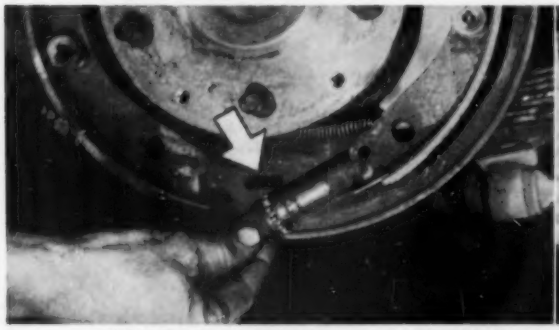
17 PRESS THE SHOES TOGETHER against the groove in the anchor pin and replace the guide plate. Hook the retracting springs from the brake shoes to the anchor pin.

20 SLACK OFF THE PARKING-BRAKE CABLE (photo at left) before replacing the drum. The adjustment, undoubtedly taken up at least once during the life of the old linings, will now be holding the shoes out.

21 BLEED THE BRAKE LINES (right) before adjusting the brakes. Starting at the rear wheels, attach a bleeder hose (19 cents) to the bleeder fitting and let its free end dangle into a jar half-filled with brake fluid. Open the bleeder valve about ¾ of a turn and have someone step slowly on the brake pedal to force the air bubbles out into the jar. Allow the pedal to return slowly to normal position and depress it several more times until no more bubbles appear in the jar. Repeat this operation on all wheels, and refill the master cylinder with fresh fluid after bleeding each wheel.



15 NOW PUT IT ALL TOGETHER. Grease lightly all points (arrows) that contact the shoes. Connect the parking-brake cable to the lever, place the secondary (trailing) shoe in position and secure it with a hold-down pin, spring and cupped retaining washers.



18 PUT THE ADJUSTING SCREW IN PLACE on the lower end of the shoes. If the cog doesn't center over the slot (arrow), it's in backwards. Turn it end for end and reinstall.

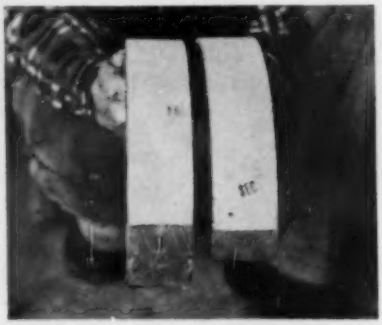
19 HOOK THE ADJUSTING-SCREW SPRING on one shoe and stretch it across to the other shoe. Brake pliers are helpful here as this spring is hard to hook on with ordinary pliers.

22 ADJUST THE BRAKES. Loosen the anchor-pin lock nut. Then insert an adjusting tool in the hole in the backing plate and swing the tool upward to expand the brake shoes tight against the drum. Rap the drum with a hammer to center the shoes, and tighten the anchor pin. Back off the adjustment, swinging the tool handle down, until the wheel barely drags. If the drum is slotted near the edge, insert a .010" feeler between it and the shoe and turn the adjusting screw until the shoes touch the feeler.

23 FRONT DRUMS come off easier. Leave the wheel on, but pry off the disk and dust cap. Pull out the cotter pin and remove the bearing nut. Wheel and drum come off together. Install a new cotter pin.

24 **A WHEEL PULLER** is needed to remove rear drums on Chrysler cars and some independents. If you buy or borrow one, here's how it's used: Bolt three arms to the wheel lugs after removing the cotter pin and nut. Tighten the handle to seat the puller screw against the end of axle, then rap the right end of the handle with a heavy hammer to force the drum off.

25 **CHRYSLER CARS,** some independents and early Fords have a brake adjustment like this. Looking at the wheel from under the car, turn the left adjusting nut outward to the left and the right nut outward to the right about ⅛ turn to tighten the shoes against the drum. Adjust separately until the wheel locks; then back off until it barely drags.

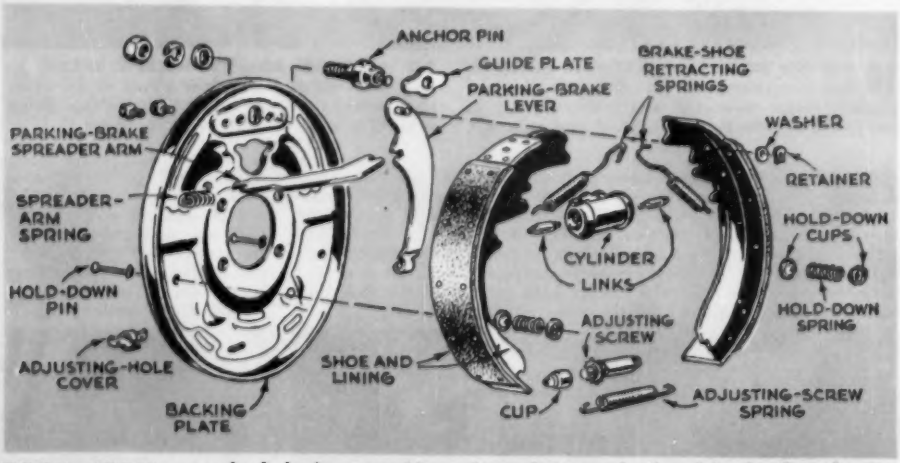


How to Buy New Lining

MOST CONVENIENT are linings bonded to replacement brake-shoe sets. You take out your old shoes, put in the new ones and turn in the old ones for credit. Shoes are usually marked primary and secondary. Primary shoes go in the front position on each wheel, secondary toward the rear.

You can also buy formed-lining sets and mount them on your shoes with a 95-cent relining tool, saving both money and the bother of turning in old shoes.

A third type comes bonded to a plate that clamps over your old shoes. Just remove the old lining and fasten the plates to them by bending steel tabs over with a tool included in each set. Give the year, make and model of your car when ordering lining or replacement shoes.



TYPICAL BENDIX rear-wheel brake assembly common to General Motors and late Ford cars. Front brakes are identical except that there is no parking-brake lever. Reference to all parts shown here can be found in detail in the preceding photos. By working from the photos and the drawing you should have no difficulty in doing an expert relining job on your brakes.

New for Your Car

1. Want a Plaid Roof? You can add color to your car by applying a sheet of this plastic decal to its top. The decals, which are removable, come in Scotch plaids with tartan red or green predominating.

2. Table-Vanity Fits Under Dash. With the lid closed, you use the top of this tray as a desk or snack table; open it and your wife finds a mirror on the underside of the lid and a pocket for stationery, tissues, cosmetics, lotions and other accessories. The versatile steel tray slides back under the dash when not in use.

3. Garage-Floor Coating Resists Oil. Grease and oil won't sink into your garage floor if you've coated it with this Bakelite vinyl coating, the maker says. You can pick up drips with a rag (below) and remove dirt with a broom or hose. One pint covers about 40 sq. ft.

4. Dimmer Has Sensitivity Control. A little knob lets you make a new automatic headlight dimmer more sensitive for activation through tinted windshields—or less sensitive, so bright moonlight or reflector signs won't fool it into dropping your lights. It works on 6- or 12-volt systems.

5. Jack Holds on Soft Shoulders. An extra leg and base form a triangle that adjusts to slanted roadsides while the main post stands upright. The bumper jack folds compactly for storage.

Please turn the page for more car items

ALMANAC
FOR MOTORISTS

Pithy proverbs, provident counsel and omens and portents of interest to horseless-carriage operators.

▸▸**Shock absorbers** that have more than 25,000 miles on them may be getting past their prime. If the ride and handling aren't up to snuff, tired shocks may be the cause.

▸▸**Form the habit** of checking taillight and stop-light reflections if you back into the garage, and occasionally check your headlight reflections on the bumper of a car ahead. Then a burned-out bulb won't go long unnoticed.

▸▸**Speeding** along unconsciously is sometimes a risk on a high-mileage trip. After you've spent hours at 65 m.p.h., whistling through a town at 45 comes easy—and can be dangerous. Better make it a practice to check your speedometer every time you come to a town.

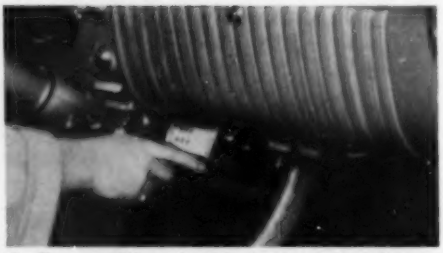
▸▸**Brakes relined lately?** New linings, like new piston rings, last best if you gentle them for a while. Let them have a chance to bed down before giving them a hard workout.

▸▸**What's the explanation** for those curious people who insist on jazzing the throttle of a newly started engine? Don't they know any better, or are they the same strange souls who draw mustaches on posters or compose washroom murals?

More Car Items

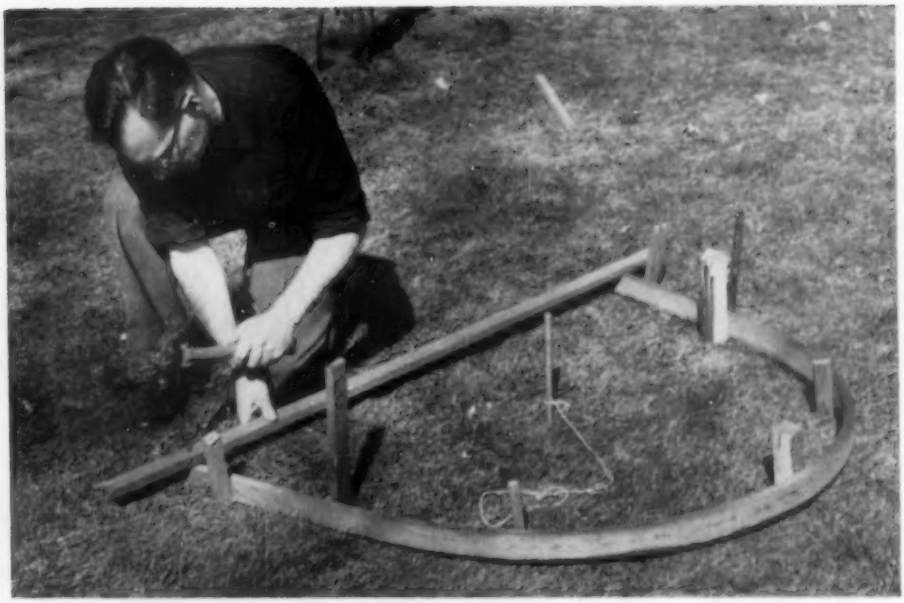
6. Repairing Tubeless Tires. Enough material to repair a dozen punctures without removing the tire is contained in this inexpensive tubeless-tire repair kit. The outfit contains a special needle and lengths of gummed cord to plug the hole.

7. Extra Mirror Shows Blind Spots. You see what's happening on your right side at all times with this small mirror to backstop your rear-view mirror. It fits on top or below, swivels in any direction.



8. Buzzer Signals Gas Is Low. An electric alarm on the dash will let you know when your gas tank gets down to two or three gallons. The device, connected to the gas gauge and ignition switch, comes in three models, fits 6- and 12-volt systems.

Further information on these new car products can be obtained from: 1. Engine Products Mfg. Co., 5801 E. Beverly Blvd., Los Angeles 22; 2. National Products Co., 109 S. Fifth St., Gadsden, Ala.; 3. National Vinyl Products, 417 McArthur Ave., Redwood City, Calif.; 4. Maico Co., Inc., 21 N. Third St., Minneapolis; 5. Triangle Jack Co., Inc., P.O. Box 2034, Wichita, Kan.; 6. T-M Products, Inc., 772 Division St., Evansville 7, Ind.; 7. Pioneer Developments, Inc., 71 Nassau St., NYC 38; 8. Talco Engineering Co., Inc., 2685 State St., Hamden, Conn.



SIMPLEST FORM FOR BENDING and setting long strips of wood is a group of stakes driven into the ground in the desired shape. After bowing the strip around them, anchor the ends with a tie piece nailed across the ends.

You Can Bend Wood at Home

By F. A. Strenge

IF YOU'VE been toying with the idea of fixing some handsome curved furniture legs, or making the kids a toboggan, it's time you took another look at bending wood. Bent pieces are stronger than bandsawed ones where the grain runs out along the edges. They save on stock, too. And bending is easier to do than you may think.

Scientists at the U.S. Forest Products Laboratory have worked out four rules for bending without breaking:

- Pick the right kind of wood.
- Use a high grade of that type.
- Soften the wood thoroughly.
- Use bending tools and jigs (simple ones are easy to rig up).

Good bending woods are among the hardwoods you are most likely to choose anyway. The boatbuilder's favorite, white oak, is generally considered tops. Also recommended are: American elm, ash, hickory, beech, yellow birch, sycamore and red oak. Softwoods—pine, firs and spruces—are not so good.

The Forest Products experts have figured out how far you can bend some woods without breaking them. A table on page 228 gives their findings.

How to select bending wood. Even the top-rated species vary in bending quality. Here are tips to help you choose.

- Use air-seasoned stock. The moisture in green wood may create internal pressure during bending and cause breaks. Green wood will also shrink and surface-check when it dries. Kiln-dried wood may be too dry to plasticize well.
- Use flat-grained lumber, which has the broad annual-ring pattern on the

You can rig up simple ways at home to soften wood for bending

EAVES TROUGHS, dammed with earth, make good containers for soaking long strips. Keep the water hot by covering them with blankets.

SHORT STRIPS CAN BE PLASTICIZED in boiling water. A pipe container, sealed with a threaded cap or soldered, can be hung over a fire.

wide surfaces. Check edge grain to be sure the dark lines run straight and true.

• Avoid lumber with defects. Check for knots, fine surface cracks, separations between annual rings, pith or decay. Reject unnaturally colored wood, especially if it has irregular black lines between color zones; this may indicate decay.

Prepare wood for softening by cutting it to the width and thickness of the finished part. Leave extra length, however, for joints and for squaring off later. Plane all surfaces smooth. Apply aluminum paint to the ends to prevent absorption of too much water.

Often you can thin down a section to make it bend easier. If you need a thick bent piece, it may be best to build it up by laminating several thin strips.

Never drill a piece before you bend it. Breaks start easily around holes.

How to soften wood. Technically called plasticizing, softening makes wood pliant and also makes it hold the finished shape. Heat and moisture do the trick.

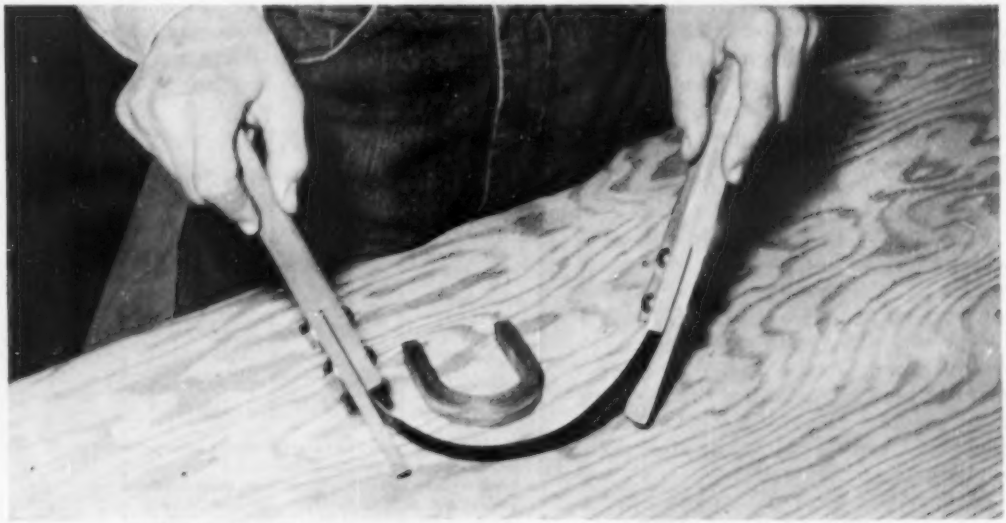
Steam works best, but is not easy to

Thin pieces bend most easily

A LAYUP OF SEVERAL STRIPS can be bent over a form more easily than a single, thick piece could. Properly glued together after the bending, a laminated part of this type will prove exceptionally strong.

YOUR WIFE'S IRON CAN SOFTEN THIN PLYWOOD for mild bends. Soak the sheet in water and work over both sides with the hot iron. Or you can place a damp cloth on the part to be bent and run the iron over it. Still another dodge that works well on thin strips is to bury the pieces for an hour or two in moist, hot sand. None of these methods, however, will permit bends as sharp as those that can be made by softening the wood with steam.

Easy-to-make strap restrains wood for bending without breaking



A BENDING STRAP enables you to form strips of thin wood to sharp curves. It consists of a strip of thin sheet metal bolted between slotted hardwood handles. The metal must be just long enough so the wood strip butts snugly against the shoulders of the two handles as at left above. As bend is made, the metal, and handle shoulders, keep the outer surface of wood from stretching—and breaking. Wood can be compressed, but not stretched.

Jig sets shape permanently

A BOATBUILDER'S FORM has wood strips nailed between two bulkheads to handle identical pieces. The metal strap over the outer surface of the workpiece assures a strong bend. The form and strap also serve as top and bottom parts of a jig to hold the piece until it is set.

use on big pieces in the home shop. Fair-sized pieces of wood, however, can readily be handled in a wash boiler on the kitchen stove. Suspend the wood in the boiler and allow an hour's steaming for each inch of thickness.

Boiling water is okay, but it also is limited by home equipment to smaller pieces. Boil an hour per inch.

For long strips, your best bet is hot water. Soak the wood overnight in cold water, and then two or three hours in very hot water just before bending.

Heat alone works fairly well. Where only one part of a stick is to be bent—a cane handle, for example—play a blow torch on that part, especially the underside. A little scorching won't hurt and can be sanded off later.

Handle plywood in much the same way as lumber, although it won't bend as sharply. Use exterior plywood—bending grade, if available—made of Grade A (softwood) or Grade 1 (hardwood) veneers throughout. Thin hardwood plywood is best for anything sharper than a 20″ radius. Douglas fir plywood as thick as 1″ can be bent some after thorough soaking in hot water.

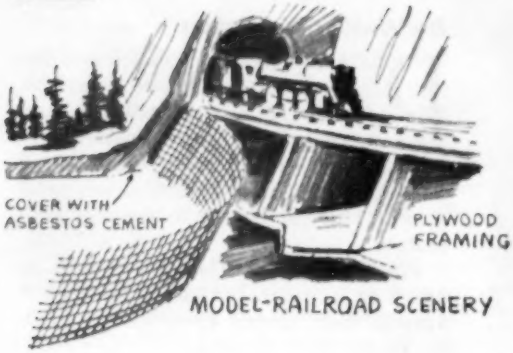
Making the bend. When you bend a piece of wood, you stretch the outer surface and compress the inner. Wood can take compression, but doesn't want to stretch. By using bending equipment, such as the straps in the illustrations, you avoid overstretching and put more of the bending action into compression, thus reducing breakage.

You need something to restrain the bent piece—particularly on its outside surface—while it cools and dries, otherwise it may crack and break after you think everything is okay. Either assemble it with other parts so that it holds its shape, clamp it in a jig, or leave the bending straps on. Large parts may take weeks to dry, but small parts can be dried overnight in an oven heated to 160°. END

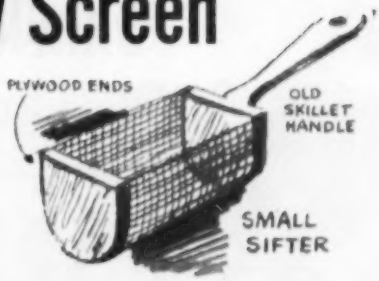
WOOD SPECIES	SMALLEST BENDING RADIUS	
	WITH BENDING STRAPS	WITHOUT BENDING STRAPS
white oak	0.5″	13.0″
sycamore	1.5″	14.5″
American elm	1.7″	13.5″
yellow birch	3.0″	17.0″
beech	4.0″	14.5″
American ash	4.5″	13.0″

These figures from the Forest Products Laboratory are based on steam-plasticized 1″ lumber. Exact figures are not available on other hardwoods, but in general red oak and hickory can be bent to 5″ radius with straps, about 15″ without. Central American mahogany, typical of remaining hardwoods, will take 12″ and 28″, respectively.

12 USES FOR Window Screen



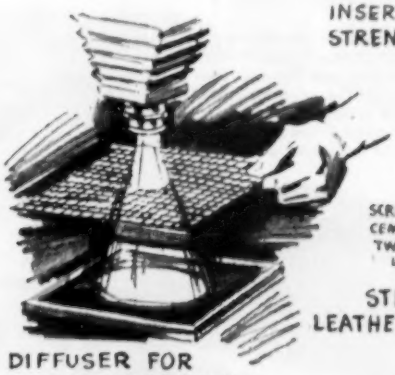
MODEL-RAILROAD SCENERY



SMALL SIFTER

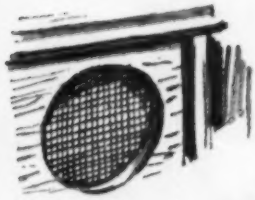
INSERT STRENGTHENS JOINTS

PATCHING HOLES IN GUTTERS

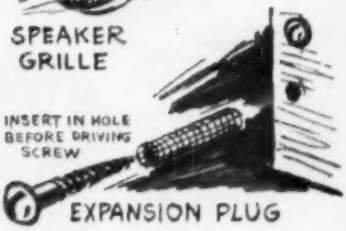


DIFFUSER FOR PHOTO ENLARGING

STIFFENING LEATHER FOR CAMERA CASE ETC.

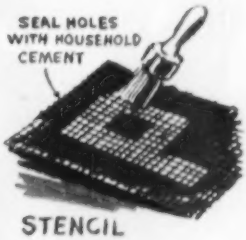


SPEAKER GRILLE

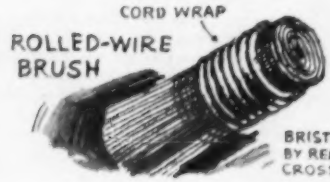


EXPANSION PLUG

PICTURE MAT



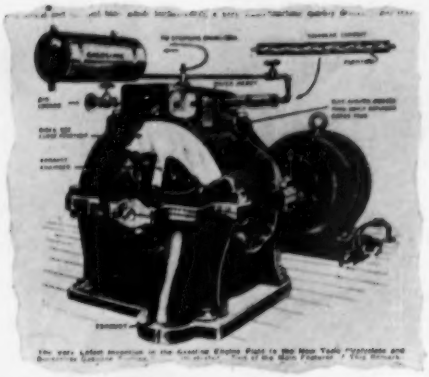
STENCIL



ROLLED-WIRE BRUSH

SPATTERWORK SCREEN

Cardboard Blower Works

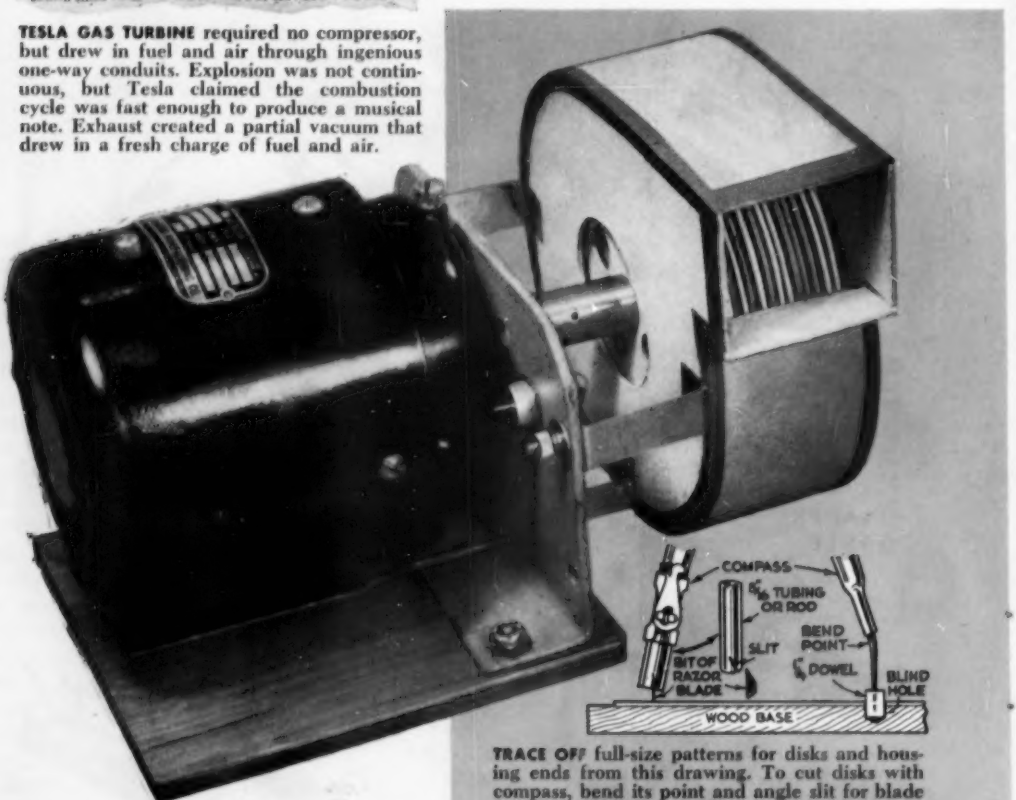


TESLA GAS TURBINE required no compressor, but drew in fuel and air through ingenious one-way conduits. Explosion was not continuous, but Tesla claimed the combustion cycle was fast enough to produce a musical note. Exhaust created a partial vacuum that drew in a fresh charge of fuel and air.

By Walter E. Burton

DECADES before skin friction began to pester airplane designers, Nikola Tesla harnessed it to produce power. Tesla, the Croatian-born engineer who gave us alternating current and the induction motor, was after a more efficient engine to spin his generators.

The Tesla turbine had no buckets or vanes on its rotor, but only a number of smooth disks closely spaced on a shaft.



TRACE OFF full-size patterns for disks and housing ends from this drawing. To cut disks with compass, bend its point and angle slit for blade so that both are vertical when legs span 2½". Clamp if possible. Punch ¼" shaft hole first. Slip this on the dowel covering the compass point, and set into hole in base. Cut part way through from one side, then flip over.

THIS HOMEMADE BLOWER, which delivers a respectable air stream on modest power, is based on the principle of Tesla's vaneless turbine. You can build it of cardboard.

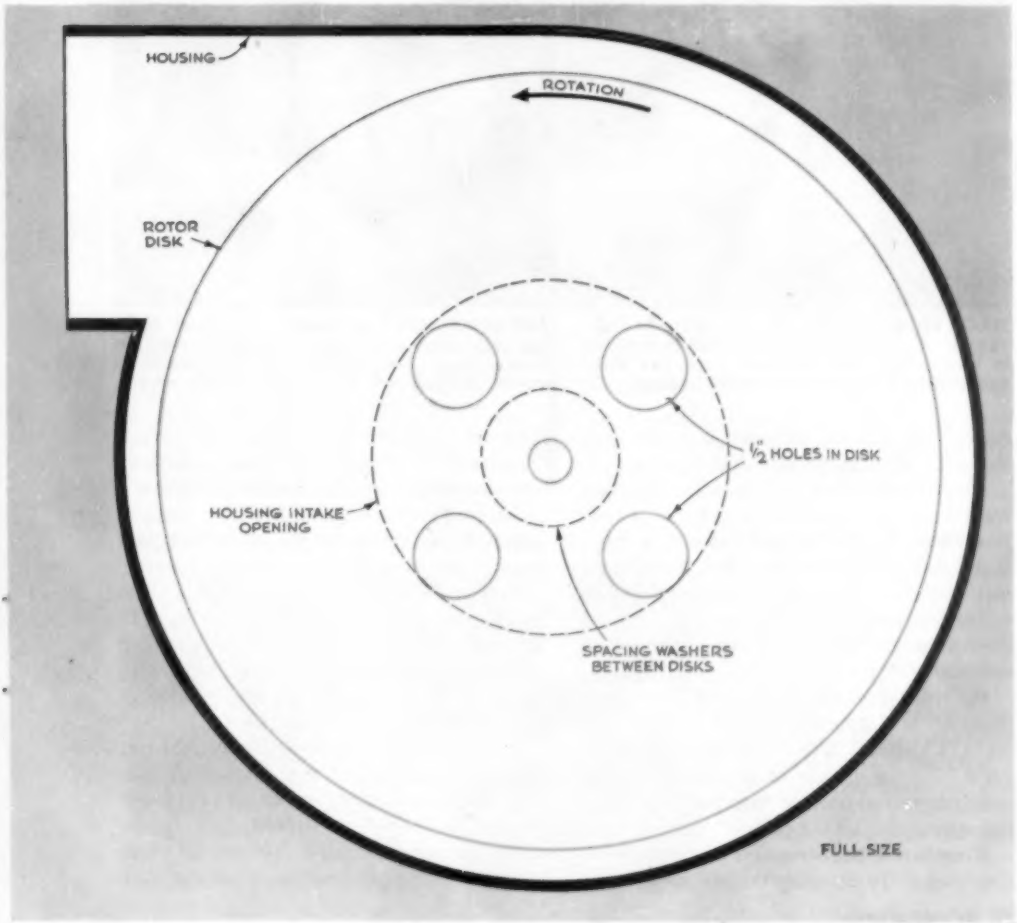
Like Tesla's Lost Turbine

The power jet was directed against the edges of the disks, exhausting through holes in them near the shaft.

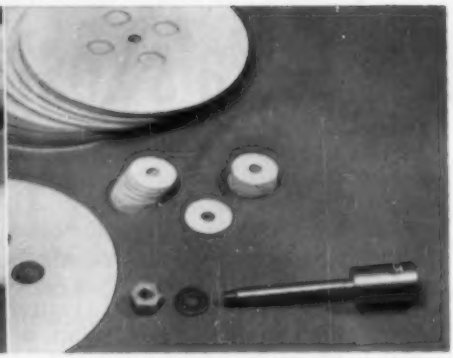
It works as a blower. Using the same disk rotor, you can build a quiet, effective little blower. It will ventilate a darkroom, cool electronic or projection equipment, or dry negatives, photo prints, or painted objects.

Made of cardboard, the blower shown produced a moderately strong breeze when mounted on a 1/30-hp. motor that runs at 1,525 r.p.m. It hurls air off the

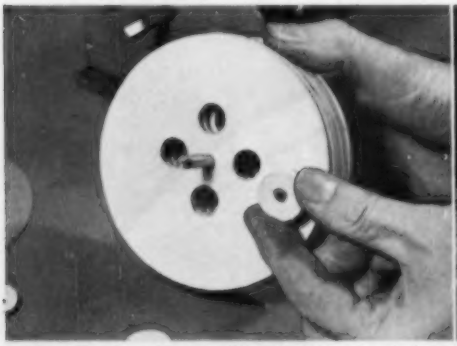
A GASKET CUTTER makes short work of the 15 disks. The shaft hole must be accurately centered. If you use a compass, as in the drawing, punch the center and swing the cut from it.



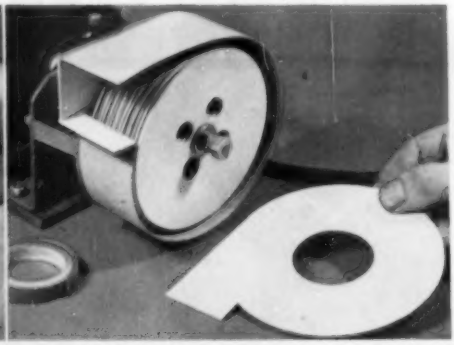
AIR INLET HOLES are best cut with a punch like this, but can be made with a razor blade. Lay them out on one disk, cut out, and use it as a guide for spacing holes in the others.



BLOWER SHAFT shown was turned to fit a small motor. For an experimental setup, clamp the disks on a ¼″ bolt with the head cut off. Chuck in an electric drill or a drill press.



STACK ROTOR DISKS with all air-intake holes aligned. A cardboard washer, small enough not to block these, goes between each two disks. Sandpaper off any burrs or ragged edges.



CUT INTAKE HOLE in the center of each housing end. Glue and tape a 1⅞″-wide strip between them. Tin-can brackets are riveted to inside housing end and bolted to the motor.

rims of its blades, drawing it in through the holes that serve as exhaust ports.

Powerhouse in a hat. Tesla's first model was so small and light for its output as to be a "powerhouse in a hat." Built in Long Island in 1906, it weighed less than 10 lbs., was about six inches in its greatest dimension, and developed 30 hp. when connected to a source of compressed air.

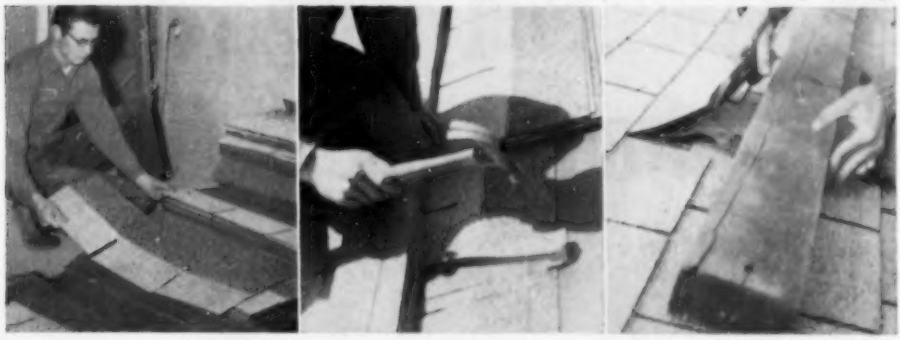
Its rotor consisted of eight flat metal disks 6″ in diameter, spaced 1/32″ apart on a 1″ shaft. The housing had to be 1/64″ bigger inside than the disks, for they expanded almost that much at their top speed of 35,000 r.p.m.

Blowtorch turbine. To dispense with the boiler, Tesla adapted his idea to an internal-combustion turbine, shown in the drawing on page 230 from a 35-year-old contemporary magazine. By the use of one-way conduits of his own design, Tesla achieved a pulse-jet effect fast enough to produce continuous rotation.

Bigger Tesla steam turbines were also built. One made in 1911 turned up 110 hp. with disks only 10″ in diameter. But a 500-kw. generating unit with 60″ disks suffered from metal fatigue and other ills that beset all turbines.

Because other turbines were already highly developed, it was bypassed. Except for use in an early auto speedometer, in which a driven disk partly rotated a spring-loaded one placed close to it, the principle has lain dormant. END

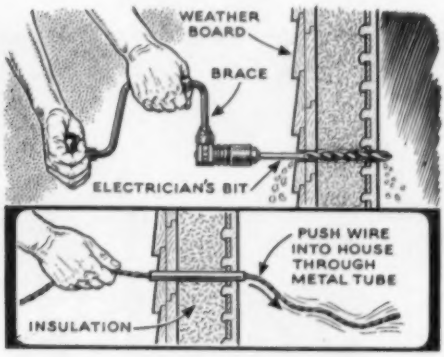
Timely Tips for Roofers: Mixing 'Em Up and a Safety Step



BEFORE you start nailing on shingles, remember to check the bundles for color variations. These show up noticeably if several shingles of one shade end up together. To mix 'em up, pile the shingles like steps and alternate them by taking one from each pile (above left).

Long two-by-fours nailed to a sloping roof keep loose asphalt shingles and tools (and roofers, too) from slipping. No trace remains on the roof when the job is finished.

First, nail two pieces of tin to the bottom of one two-by-four about 2′ in from the ends. Then, with the two-by-four about five courses up and parallel to the roof's edge, nail the tin down, as in the photo at center above. Repeat with other two-by-fours at 6′ intervals. These supports are removed later by raising the shingles and snipping the tin (right).—*Ralph S. Wilkes, Keuka Park, N.Y.*



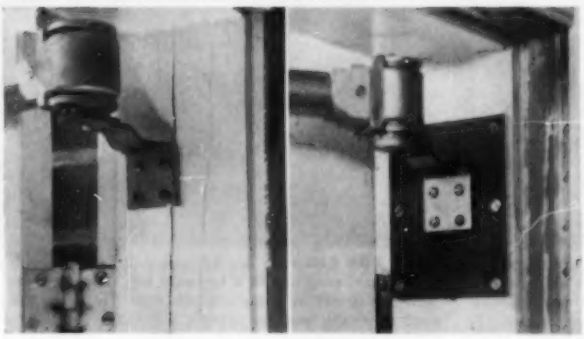
Pipe Feeds Wire into House

THREADING an antenna lead-in or other light wiring through a house wall is a hunt-and-poke headache. A short length of pipe through the hole will make it easy to push the wire through. On walls exposed to heavy rains, slant the hole slightly upward toward the inside to prevent leaks.

Furnace Filters Take a Beating

TO CLEAN your furnace filter, hold one edge and slap the dirty side against a wall. About five slaps will knock the dirt out. —*George C. Henderson, Detroit.*

Wide Plate Behind Door-Closer Bracket Braces Damaged Jamb



DOOR jambs that support closing mechanisms may split under hard usage or, as in my case, because the wind catches the door and springs it back. To save a tough replacement job, I bolted the bracket to a wide metal plate, and then screwed the plate to the jamb, as shown at near left. It's also a good preventive and strengthens the jamb against further splitting.—*J. C. Hayden, Lexington, Ky.*

He Builds Everything from Cradles to Boats

Remember the man who built a boat in his workshop, then couldn't get it out the door? Carl Koch is doing just that—deliberately.

By John L. Springer

FAMOUS as a designer of modern houses, Carl Koch is currently building a boat—a big one—in his workshop. But he isn't worried by that old gag about getting it through the door. When the 42-foot-long, 10-foot-wide yawl is ready for launching, he's going to tear down one entire workshop wall and haul her out.

Koch designed his shop, in Concord, Mass., with his boatbuilding project in mind. He knew just what he wanted. The shop measures 24 by 50 feet. To provide headroom, he made the ceilings 10 feet high. Ceiling joists run the full 24-foot span—no lally columns.

You would need a fat checkbook to duplicate this workshop. It's really a capacious ground-level basement of a house—with the house part of it playing

AN IRON BAR bent to size and painted white supports this cradle that Koch designed and made for his baby daughter. The rest of the cradle was fashioned from plywood scraps.

LONG RUB RAILS on his 42-foot yawl get a sanding. Hand-sanding is a tedious job, but it gives him the finish he wants. Koch says the boat will cost $20,000, and be worth $30,000.

ALL HAND TOOLS are kept by architect-designer on a rack on which he has outlined their silhouettes. While nobody has an excuse for not returning a tool to its proper place, sign above indicates that he faces the usual problem. Eighteen-foot-long bench incorporates storage cabinets. Koch estimates worth of his equipment at not less than $2,000.

ANOTHER ARTICLE ABOUT

The Other Fellow's Shop

second fiddle. The workshop floor area is a husky 1,200 square feet.

Koch has practically every piece of equipment a hobbyist could want. One exception: a thickness planer.

"I'm spending plenty of time trying to find an excuse to buy one," he says.

The boat project, too, is requiring a considerable amount of folding money. Koch designed the thing himself. Then he sent his ideas to Laurent Giles, a naval architect in England. Rejecting the usual wide-plank method of boat-building, Koch is using the old-fashioned narrow-strip planking. He believes that will make a stronger hull.

The strips are 1 7/16-inch Maine cedar, nailed and glued after steam-bending. The strips are beveled, and nailed every six inches with anchor-fast bronze nails. The nails cost two cents apiece.

Koch uses paper-backed, three-quarter-inch marine plywood for interior bulkheads. He must make one joint. To keep the bulkhead at full strength, he has devised a way of scarfing by using a router instead of a plane. The router rests on a metal bar that governs the depth of the plywood to be shaved. This enables him to make an even eight-inch incline for one-in-twelve scarfing.

His most backbreaking effort to date has been laying the lead keel. One night he and a friend set up an old bathtub in the workshop yard, heated it with two kerosene stoves, and melted down 5,420 pounds of lead. Molten, the lead was poured through the tub outlet into a wooden form beneath. After it cooled,

the keel was rolled into the shop and set in place.

Getting the boat out actually will be simpler than it seems. Koch already has knocked the siding and sheathing off one wall of the workshop and nailed composition board to the studs as protection against the weather. The wall bears no load, so when the boat is completed—by Christmas, he hopes—he will knock out the studs to give him the opening he needs.

To roll out the keel, he plans to use either one-inch pipe, or a few buckets of golf balls thrown into a narrow channel on the floor. Then he will truck his boat to Gloucester, 50 miles away.

Now 42, Koch has been a woodworking hobbyist since boyhood. He had a cellar shop in his home in Chicago, where he was raised, and took woodworking in a public school in nearby Evanston. He began acquiring tools in earnest after being graduated from Harvard's School of Design in 1937.

In his shop Koch has designed and made many of the furnishings for his three-story hillside home nearby: bookcase, hi-fi cabinet, coffee table, sofa, end tables.

Koch also used his workshop to experiment with ideas for a prefabricated vacation cottage. He is now distributing it nationally. It comes with factory-assembled wall panels and floor sections, and windows and doors, and precut floor joists and rafters. He says two men can finish the entire job in two weekends.

Built in 1951, the workshop bears a strong resemblance to Koch's Techbuilt prefabricated house (PSM, Apr. '55, p. 98) which brought him international renown as an architect. In fact, Koch put some of the design features of the shop into the Techbuilt.

Koch's sons are becoming skilled woodworkers, too. Watching their dad's labors on the yawl, Otto, 11, and Carl Jr., 6, got an idea. With his help, they built a rowboat in the shop to serve as a dinghy for the big vessel.

"At least," remarks Koch, "their boat will get through the door."

LEAD KEEL ON YAWL is smoothed down with power sander. Koch has an intercom between home and workshop, which is a separate building, set in the woods 100 yards away.

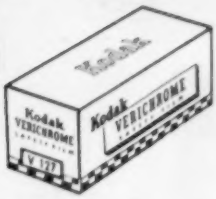
WITH SAME METHOD he uses on chairs—but heating with steam instead of hot water—he bent narrow planking for boat. Wood was softened in steel pipe. Fireplace provided heat.

IN HIS DEN, Koch lounges in one of many identical chairs he made. Cushions rest on steel springs attached to underside of frame. One-piece chair supports and armrests were formed with a steel-and-wood jig. They were built up from 1/12" laminations, softened in hot water and glued together. "The chairs made wonderful presents," he says. "I've only a few left."

LOOKING FORWARD to getting his boat out of the workshop, Koch already has torn down siding on one of the walls and tacked on temporary composition board. Studs will come out, too.

AT DRAWING BOARD of his den-bedroom on third floor of his home, Koch works on a building plan. Dramatic window expanse in background forms full side of the house. END

How to choose the right film for the right job



To suit the wide variety of picture-taking situations you may encounter—and to give you more control over the results—Kodak makes a number of different films. Each has its own special merits and applications. Below, we describe the most widely used Kodak black-and-white and color roll films. It will help you to know what each is especially made for.

One suggestion: learn about one film at a time by *using* it. Learn the proper exposures for various lighting conditions. In other words, find out what the film can actually do for you before you tackle others. That way you'll get the most out of the special qualities built into each Kodak film. And it will show up in the quality of your pictures.

You can process all Kodak black-and-white films at home and make prints and enlargements yourself. Kodak's new Ektachrome Film can also be home-processed.

BLACK-AND-WHITE FILMS

Taken on Verichrome Film, 1/50 at *f*/8

Taken on Plus-X Film, 1/200 at *f*/16

KODAK VERICHROME FILM is a fairly fast all-purpose orthochromatic film for everyday snap shooting—using either daylight or flash. It will give good tone gradation and moderate grain. It has a wide exposure latitude and thus permits reasonable exposure errors. This saves many a picture when there's neither the time nor inclination to be very precise about exposure. It is ideal, of course, for fixed-shutter, fixed-aperture cameras. It is available in popular roll-film sizes—116, 120, 127, 616, 620.

KODAK PLUS-X FILM is a fast, fine-grain panchromatic film capable of excellent tone rendition, reproducing colors with the same degree of brightness as your eye sees them. It's the film to use for all indoor and outdoor work when enlargements are to be made from small or moderate-size negatives. It is desirable, too, when brightly colored objects are pictured, or where accurate rendering of delicate flesh tones is sought. Plus-X is available in roll-film sizes, including Nos. 135 and 828, and in film packs.

Taken on Tri-X Film, 1/100 at f/3.5, no flash

KODAK TRI-X FILM is a new, extremely fast panchromatic film of moderately fine grain. It is so sensitive that pictures may now be taken in light so subdued that good shots would hitherto not have been possible. Tri-X Film, in effect, gives the man with an f/3.5 lens an f/2 lens, and enables the man with an f/2 lens to get pictures impossible to get before. Because of its speed, Tri-X alternatively permits faster shutter speeds for action pictures or reducing the aperture for great depth of field. Tri-X produces superb pictures indoors with only the daylight that comes through the windows—and because delicate tones are well rendered, the pictorial quality is high. Tri-X Film comes in roll film Nos. 120, 127, 620, 828, and 135. It is not recommended for fixed-aperture, fixed-shutter cameras unless the light level is quite low.

KODAK INFRARED FILM—a special-purpose film—produces unusual dramatic effects. Skies come out almost black, clouds fleecy white, and foliage very light. With this film and special infrared flash bulbs you can also make pictures in complete darkness. Kodak Infrared Film is available in 35mm magazines and in several sheet film sizes.

Taken on Infrared Film, 1/25 at f/8

COLOR FILMS

KODACHROME FILM gives you 2 x 2 slide transparencies in full, brilliant color. You can enjoy them in a hand viewer, project them on a large screen, and have them made into prints and enlargements. Kodachrome is available in miniature camera sizes Nos. 135 (20 or 36 exposures) and 828 (8 exposures) in both Daylight Type for outdoor shots, and Type A for use with flood or flash lamps.

KODAK EKTACHROME FILM is a new, fast color film in both roll and miniature sizes which provides excellent color transparencies comparable in quality to the Kodachrome type of film. But Ektachrome is three times as fast outdoors as Kodachrome. This makes it particularly valuable in situations where subjects are poorly lighted, or when faster shutter speeds to stop action are necessary. Ektachrome comes in Nos. 135 and 828 sizes, which give you 2 x 2 color slides for viewing in a hand viewer, projecting on a screen, or from which color prints can be made. The 120 and 620 roll-film sizes are generally used for making prints only, although there are projectors large enough to accommodate them in the form of slides. Both Daylight Type and Type F (balanced for clear flash lamps) are available. Processing is done by local laboratories through your dealer. Or you can develop Ektachrome Film at home, if you wish, with the Kodak Ektachrome Processing Kit, Process E-2, $1.80. Kit capacity is six 20-exposure 135 magazines or ten 828 rolls; for 120 and 620 film, four to five rolls.

KODACOLOR FILM, when developed, results in a "color negative" from which sparkling color prints are made. Kodacolor snapshots can be made with most any roll-film camera. It is fast enough to be used even in a simple-lens camera.

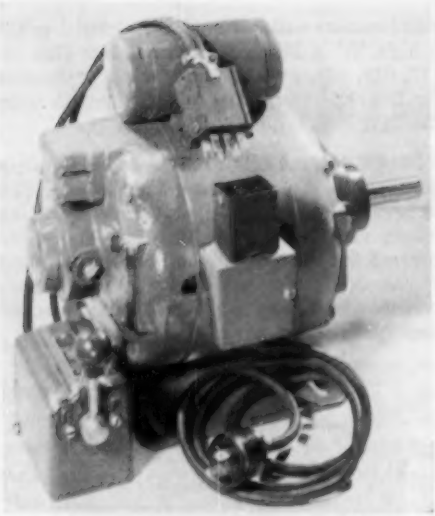
Kodacolor is available in Daylight Type or Type A for artificial light. It comes in popular roll-film sizes—116, 120, 127, 616, 620, 828.

Your Kodak dealer will help you select any Kodak film you need. He also has the Kodak Films Data Book which gives detailed information of these and other Kodak films—each designed for a particular purpose.

Prices subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

Kodak



Six-Prong Plug Is Fast Cutoff

EVERY time I removed the motor on my lathe to clean it or use it on other tools, I had to unwire the six leads that run to the reversing switch, tag them, then wire them up again. With this six-prong plug, available at radio-supply stores, I can disconnect the motor in a minute. Be sure to mount the female half on the motor terminal box so that there's no danger of shock. For tools without reversing switches, wire up an extra dummy plug that can be inserted to energize the motor.—*H. L. Phillips, Watertown, Mass.*

Solder Guides Linoleum Laying

HERE'S how to fit linoleum around odd-shaped corners or projections. Bend a piece of solder wire to the shape wanted. Then lay the solder on the linoleum, trace the pattern with pencil, and cut.—*Stanley Clark, East Bradenton, Fla.*

Grommets Take Edge Off Keys

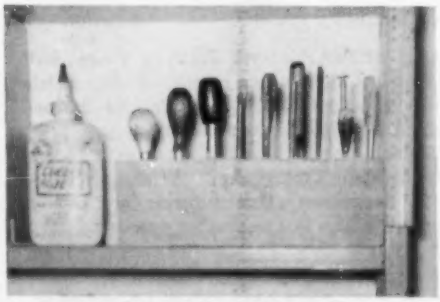
SHARP edges of antique or spring-driven clock keys sometimes cut into the fingers. Remedy: Insert rubber grommets (available at radio-supply shops) into the arm holes.—*Walter E. Burton, Akron, Ohio.*

Pencil Becomes a "Grease Gun"

AN OLD mechanical pencil makes a miniature grease gun for lubricating tiny, hard-to-reach parts. Remove the mechanism, fill the lower barrel with grease, and use a snug-fitting dowel pin to ram the grease out the tip.—*J. W. Rocke, Atkinson, Nebr.*

Sharpener Chamfers Dowel End

A DIME-STORE pencil sharpener can be put to use in the shop to make a neat and quick chamfer on the end of a small-size dowel.—*Frank A. Javor, N. Bergen, N.J.*



Two-by-Four Holds Small Tools

TINY screwdrivers, awls, nail punches and other small tools are often mislaid among larger tools. I put mine within easy sight and reach by drilling the edge of a short length of two-by-four with holes of the proper size and depth for each tool.—*H. N. Webster, Nutley, N.J.*

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Lumber Dealers from Coast to Coast
Announce...
September '55 Home Improvement Month
for "Giving Your Home A New Look"

This is the month for "Giving Your Home A New Look." It is the ideal time to build, remodel and repair the home and its environs. On behalf of 26,000 lumber and building material dealers—the NRLDA invites you to visit any of their outlets—where you will find worthwhile values, brands, and friendly service.

You will find your local lumber-building materials dealer fully prepared to serve all your Do-It-Yourself home-handyman needs. In addition—you will find that you'll get practical "how-to-do-it" help from the same experts who advise and supply professional builders.

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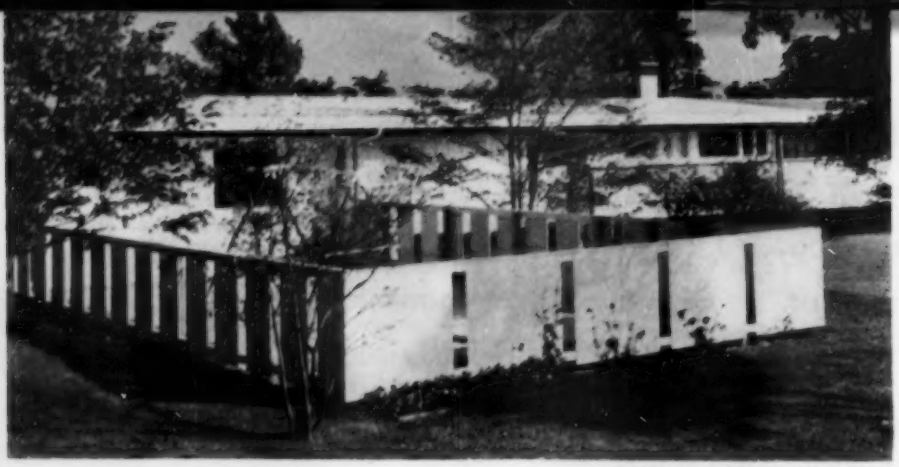
NATIONAL RETAIL LUMBER DEALERS ASSOCIATION

18th and M Streets, N.W., Washington 6, D. C.

N R L D A



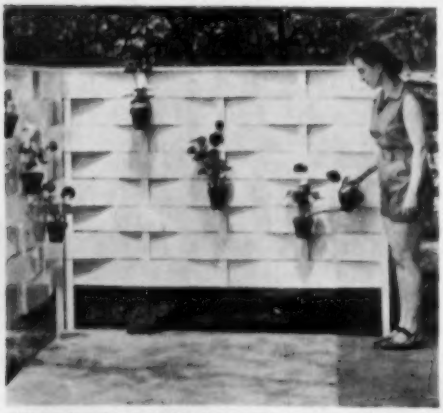
CORRAL FOR THE KIDS combines ready-cut 4′ squares of hardboard and 16″-wide planks. Four-by-four posts are spaced 4′ apart with 2″-by-4″ rails nailed flat against the sides of the posts at top and bottom.

How to build hardboard fences

HOW'LL you have your fencing—plain, grooved, embossed, striated, full of holes? Want big 16′ sheets, neat 4′ squares, ready-cut planks and strips? You can get them if you choose hardboard, which comes in an abundant variety of types, shapes and sizes.

By designing the fence to use stock sizes, you can save fussy fitting and cutting. By using different types, you can

[*Continued on page 244*]



WOVEN FENCE AROUND A PATIO is easily made by weaving flexible 6″-wide strips of hardboard in a light frame of 1″-by-2″s. End posts are 6′ apart, with spacer strips every 18″ and a 1″-by-2″ cap strip nailed across the top.

HORIZONTAL LINES give a feeling of length in the fence above. Panels are staggered on opposite faces, exposing rails on both sides. You can add as many rails as you like, but use at least two (sketch) for good bracing.

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your one best,
one-stop source

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There are more than 20,000 lumber and building material dealers in big city, small town, *your* town . . . all over America. Many of them are supermarkets, handling the best in everything from hand and power tools and hardware to garden supplies and garden furniture . . . wall coverings and floor coverings . . . paint and painting supplies . . . as well as complete stocks of lumber and building materials.

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- Rubber, Asphalt Tile & Linoleum
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- Paint & Painting Supplies
- Garages & Garage Doors
- Kitchens, Cabinets & Counter Tops
- Ventilating Fans
- Farm Building Plans & Materials
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- Lawn & Garden Equipment
- Brick & Cement
- Fencing
- Glass
- Fireplace Units & Accessories

. . . practically *everything* you need for home building and home making, except food and clothing!

BUILDING SUPPLY NEWS

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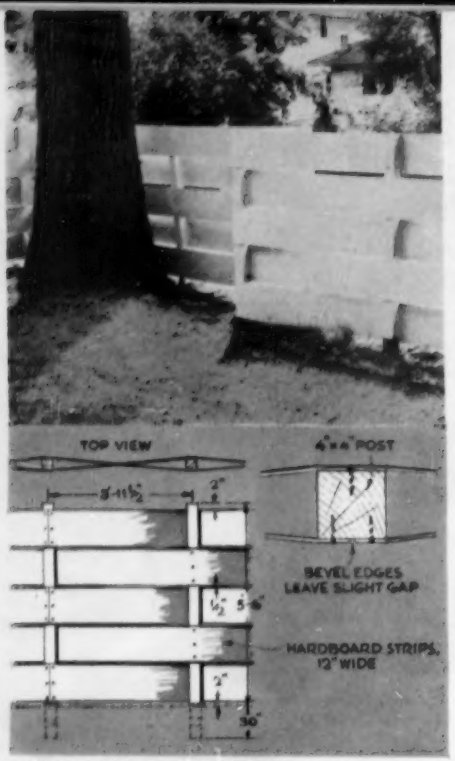


BASKET-WEAVE FENCE like this requires no cutting. Buy 12"-wide hardboard siding in 12' lengths. Note that post spacing is less than 4' to provide for length lost in weaving. Stagger strips so joints fall on alternate posts.

How to Build Hardboard Fences

[Continued from page 242]

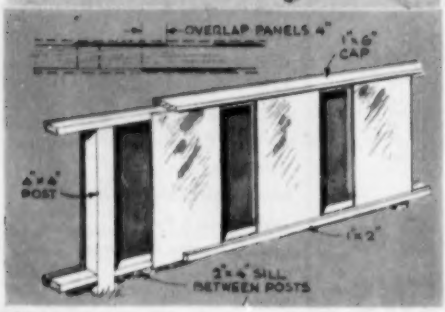
tailor it to catch wind or keep it out, give shade and privacy, or set off a patio in an attractive frame that will add beauty to your home.

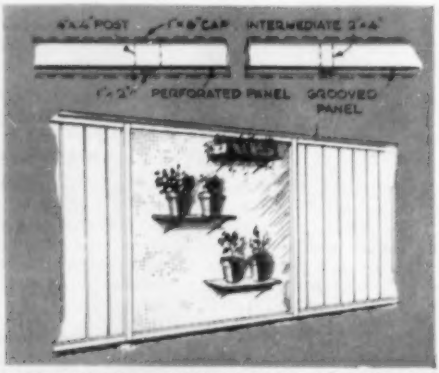
Be sure to use the outdoor variety, called tempered. For fences, hardboard ¼" thick is usually advisable.

A simple frame can be made by nailing cross strips to 4"-by-4" posts, spaced up to 8' apart. These should be sunk in the ground at least 2'. Fasten on the panels with five-penny (1¾") galvanized siding nails or galvanized box nails, spaced 4" to 6" apart and not closer than ⅜" to the edge. Start the nails with light tapping to get them through the surface before driving them home.

If both sides of the hardboard are exposed and you're finicky about appearance, use the kind that's smooth on both faces. Otherwise, the smooth-one-side type will do and is less expensive.

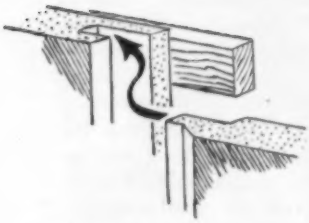
The panels benefit from bracing, of course, but for light fencing you can simply nail them to top and bottom rails or to uprights at the sides without internal supports. You can paint or stain them or seal them for a natural finish.





YOU CAN ADD A SPECIAL TOUCH with perforated hardboard that will hold shelves for plants. You can also get grooved and striated sheets, which can be combined with any of the fence designs in these photos from Masonite Corp.

WINDBREAK (photo at left) shields both a carport and patio. Big 4'-by-8' sheets are used full size, nailed alternately on opposite sides. Another type (sketch) uses staggered panels to let in air but stop sun and vision.



Temlok's Lok-Bevel joint simplifies stapling or nailing, provides neat, even joint lines.

12" x 12" Temlok Tiles go up fast over 1" x 3" furring strips spaced 12" on centers. For fastening, use staples with ½" legs or 3d box nails.

How to Build an Attic Bedroom with Temlok Tile and Plank

It's easy and inexpensive to turn unused attic, basement, or porch areas into extra living space with Armstrong Temlok® Tile and Plank. These sturdy ceiling and wall finishes save you money because they build, insulate, and decorate in one easy installation.

Start the job by framing the space to the room size you want. Then nail 1" x 3" furring strips at right angles to the framing members to provide a nailing base for the interior finish.

Next, staple or nail Temlok to the furring strips. The special Lok-Bevel® joint on both Temlok Tile and Plank has an extra wide nailing flange for quick, easy installation. Besides hiding all nail heads and staples, this tongue-and-groove joint assures a neat, professional-looking joint line. Once Temlok is installed, the job is done. Tile and plank are prepainted.

Get prices and details on Armstrong Temlok Tile and Plank from your local lumber dealer.

This comfortable attic bedroom was built at remarkably low cost with Armstrong Temlok Tile on the ceiling and Armstrong Temlok Plank on the walls.

Send for free booklet, "New Ways to Remodel Your Home." Just write Armstrong Cork Company, 3709 Washington Avenue, Lancaster, Pennsylvania.

Armstrong

TEMLOK

Cushiontone® • M-67® Monowall® • Insulating Wool
Hardboards • All-Purpose Cements

HAMMER BACKHAND when you're nailing overhead. This keeps hammer parallel to ceiling and in front of your eyes for greater ease and accuracy. To help hold up big sheets, make a T brace by nailing a crossarm atop a long stick and wedge it between floor and ceiling.

PUTTING up plasterboard can be a lot easier than you may think—especially when you know some of the tricks that professional installers use. The big sheets make quick work of finishing off an attic, paneling a basement playroom or covering walls anywhere.

One tip from the pros is to use the largest sheets you can handle. Two men can carry 4′-by-12′ panels. (It's best to have a helper even on smaller ones.) Longer sheets keep joints to a minimum, reduce nailing, and add strength when put up horizontally. You can cover many walls with just two sheets, one each for top and bottom.

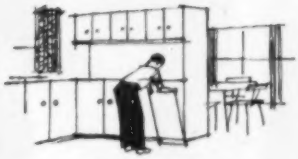
Short cuts like this make the job go faster, look better and last longer. Other pointers that you can use are shown here by plasterboard pros who can panel a 10′-by-12′ room—walls and ceiling—in less than two hours.

How to use plasterboard

ONE MAN can nail up big sheets this way. Rest bottom on floor and start nails at points that line up with studs. Then slide sheet up wall with one hand and finish nailing at the top.

PANELS BREAK CLEANLY if you score one face with a knife, then snap end back sharply against your knee. Cover smallest areas last, so that you can use leftover scraps and save waste.

Please turn to page 248 for more plasterboard tips



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Even week-end carpenters get professional results with easy-to-use fir plywood. Big, light, strong, real wood panels make building easier, more fun. And remember: When you buy plywood, insist on genuine DFPA QUALITY-TESTED fir plywood. Look for the DFPA hallmark on every panel.

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BOOK OF 52 FIR PLYWOOD HOME STORAGE PLANS

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Please send new Book of 52 Home Storage Plans. I enclose 50c to cover cost and mailing.

Name _____

Address _____

City _____ Zone _____ State _____

How to Use Plasterboard

[Continued from page 246]

DON'T WASTE TIME fitting around doors and other openings. Nail the full panels right over them, then cut out the openings later. This saves fussy measuring and gives you a perfect on-the-spot fit. Set nailheads deep enough to let cement get in—shallow dimples may let patches fall out. Mix joint cement to a fairly stiff consistency. Too soupy a mix weakens the bond.

FOOT PRY, beveled at one end, lets you jack up a sheet while you nail it in place. Use sixpenny flathead plasterboard nails, spaced 6″ apart on the edges, 9″ on internal supports. On ceilings, space them 6″ all over for greater holding power.

NAIL METAL STRIPS around corners to protect plaster edges from chipping under knocks. To keep them from showing, cover them with joint cement, just as in patching a seam.

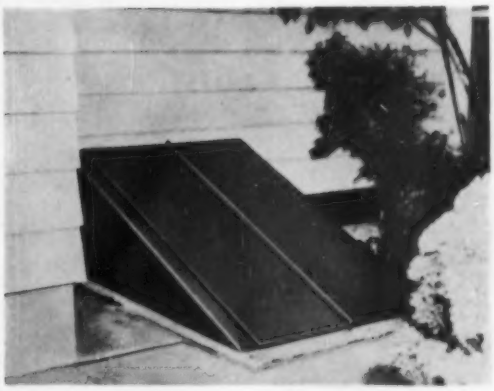
PUTTING UP TAPE is easy if you roll it on as you walk along planks set across sawhorses or chairs. Fill crack with cement first, press tape into it, then trowel the tape to smooth it out. Perforated tape must be firmly embedded to hold well.

APPLY SECOND COAT of cement after first has dried, thinning it out at the edges. Troweling the joint twice during drying produces a smooth surface that you may not have to sand. Wiping gently with a moist cloth also smooths the cement.

IN CORNERS, crease tape first and you'll get a neat right-angle joint. Use solid tape here—perforated kind is harder to smooth in tight spots. Fill nailheads with joint cement and trowel with a swirling motion for a smooth patch.

REPLACE YOUR OLD WOOD CELLAR DOOR

WITH A MODERN ALL-STEEL BILCO DOOR



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PAYS FOR ITSELF! Cost so little, yet never needs repair or replacement. Operates at a touch. Smooth, trim appearance adds amazing new beauty to your home. Rush coupon TODAY for free folder and "Do It Yourself" pamphlet showing step by step replacement of wood hatchway.

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THE BILCO CO. DEPT. W NEW HAVEN, CONN.

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Don't Be "Sold". . . Get The Facts

10" TILTING ARBOR UNISAW®

It's a fact that 72% of U. S. school shops are equipped with Delta Unisaws. The Unisaw is a rugged, big capacity saw that offers you more built-in quality features and more precision adjustments than any other saw of its size—or price. It has the speed needed for fast, economical cutting . . . the precision accuracy needed for exacting, high quality work . . . the rugged durability that gives years of safe, dependable operation. Here are just a few of the many Delta quality features that make the Unisaw the most widely used circular saw in industrial plants and in the finest home workshops, as well as the majority of school shops:

- Cuts stock up to 3⅛" thick, rips to center of a 50" panel.
- Big 27" x 36" table accurately ground for precision work.
- Patented Auto-set Miter Gage permits angle cuts from 0° to 60° with automatic stops at 90° and 45° right and left.
- Husky rip fence locks front and rear with controls up front.
- Blade guard with anti-kickback fingers prevents kickback of work.
- Has sealed, lubricated-for-life ball bearings.

DELTA QUALITY COSTS NO MORE

MAKE UP YOUR OWN MIND

about the circular saw best for your needs!

Here Are The Facts About

Rockwell-built DELTA Circular Saws:

Delta makes the most complete line of circular saws on the market—ranging from the big 12" tilting arbor saws for industrial uses to the 8" tilting table saw. Every Delta saw is built to the highest standards of quality—built to do its job with precision, ease of operation and safety. Professional woodworkers in industrial plants, school shop instructors and home workshop experts recognize Delta saws as the finest made. And Delta also makes the most complete line of accessories, many of which are interchangeable from one tool to another. That's another extra value you get from the world's oldest and largest power tool manufacturer.

HOMECRAFT 8" TILTING ARBOR SAW

Light in weight, yet rugged in construction. Popular with small shop owners and builders, as well as home workshop enthusiasts. Offers many of the outstanding quality features found in the Delta Unisaw.

- Cuts stock 2¼" thick, rips to center of 48" panel.
- 22" x 15" work table scientifically ribbed to prevent warping.
- Only the blade tilts, table always remains level.
- Sealed, lubricated-for-life ball bearings.

HOMECRAFT 8" TILTING TABLE SAW

A low-cost, all-purpose saw designed expressly for home owners—and hundreds of home owners have proved it to be ideal in making home repairs plus the many other jobs found in every home.

- Cuts stock up to 2¼" thick, rips to center of a 15" panel.
- Has 15" x 18" work table.
- Table tilts a full 45° right.
- Miter gage swivels right and left 60°.

PLUS DELTA'S COMPLETE LINE OF ACCESSORIES

With inexpensive Delta accessories, anyone of these saws can be transformed into a tool of many uses—you can cut dadoes, tenons, mouldings, miters, and bevels in addition to accurate cross-cutting and ripping.

GET ALL THE FACTS— THEN COMPARE!

See Delta's complete line of circular saws—actually operate them yourself. Then compare with any other circular saw and MAKE UP YOUR OWN MIND! See your Delta Dealer—he's listed under "TOOLS" in the classified pages of your phone book. And send the coupon for free catalog

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- ☐ Delta AB Catalog
- ☐ Delta Homecraft Catalog

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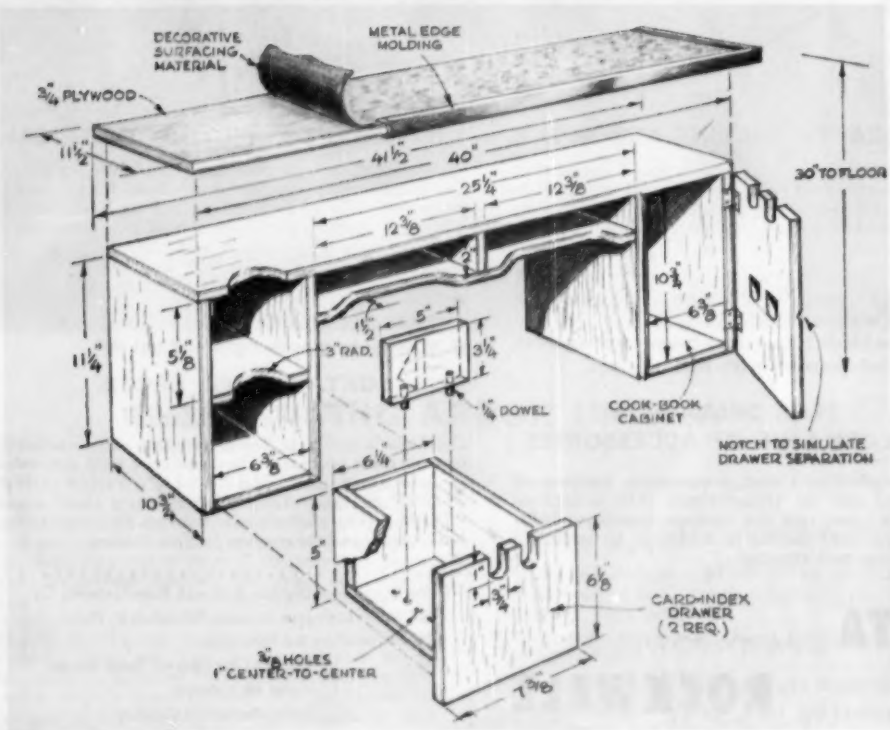
TUCKED in a corner or suspended from a wall, this shallow desk turns unused space into a handy "kitchen office." The plans can be modified (the cookbook compartment was omitted in the desk shown in the photo).

All parts except the desk top are cut from ½" plywood, sanded, and assembled with glue and finishing nails. Attach the ¾" plywood desk top last. Apply a surfacing material which matches other counter tops in your kitchen, trimming exposed edges with metal molding. Screw metal angles to the underside of the desk top and fasten them to the wall with toggle bolts. Or, for a desk supported at the ends, use bolts in the existing cabinet and toggle bolts at the wall-supported end.

How to build a kitchen desk



This new manual shows you an easy way to put a professional-looking furniture finish on any wood

48 pages: over 60 photos showing every step in finishing. Removing finish, bleaching, sanding, staining, filling, finishing and waxing. Special chapter on wall paneling. A book every home craftsman will want!

New Guardsman® Do-it-Yourself

makes finishing easy as dusting!

With these new Do-It-Yourself materials you can make wood paneling, doors and wainscoting look like fine furniture . . . make unfinished furniture or workshop pieces look factory finished . . . make old furniture look new again! No experience necessary! Illustrated manual makes each step as easy as dusting.

Look at the features you get

- All materials wipe on with a cloth, easier to do . . . less clean-up.
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- Complete range of filler and stain colors. Duplicate any finish on any wood.
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for this manual and the name of the Guardsman dealer nearest you.

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Creators of custom finishes for home and industry

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Gentlemen:

I am interested in your new Do-It-Yourself furniture finishing system. Enclosed is 25c for my copy of the illustrated manual.

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How to pick the right sandpaper

Tips to help you speed up those home-sanding jobs

SANDPAPER IS A TOOL—using the wrong kind is like using a screwdriver to do a chisel's work. Each variety of 3M sandpaper is designed to do a specific job . . . so buy your 3M sandpaper with that specific job in mind.

SAND WOOD 10 TIMES FASTER with 3M "PRODUCTION" PAPER, coated with super-hard aluminum oxide mineral. With less effort, it produces results no other sandpaper can match, and lasts 10 times longer than ordinary sandpaper.

TO SAND PLASTER SEAMS ON WALLBOARD use "WETORDRY FABRICUT" . . . it's a *brand-new* 3M abrasive product. "WETORDRY FABRICUT" is a mineral-coated cloth mesh—thousands of small openings allow sanding particles to pass *through* it, thus preventing filling and loading.

TO ACHIEVE A SATIN FINISH on furniture, use "WETORDRY" TRI-M-ITE PAPER, especially designed for final sanding operations on lacquer, varnish or enamel. It's the same sandpaper used by top furniture makers all over the country.

WHEN REFINISHING METAL LAWN FURNITURE, always use 3M "PRODUCTION" PAPER first to remove all dirt, old paint and rust. Careful, thorough sanding at this stage can help you produce a professional-looking finished job.

For any sanding job . . . get **3M ABRASIVES**

Made in U.S.A. by Minnesota Mining and Mfg. Co. General Offices: St. Paul 6, Minn. In Canada: P.O. Box 757, London, Ontario. Export Sales Office: 99 Park Avenue, New York City. Makers of "SCOTCH"

How to save work with masking tape

Tips to help you do professional-looking painting

MASKING TAPE IS A TIME-SAVER . . . helps cut painting time and clean-up work. "SCOTCH" Brand Masking Tape is designed for the do-it-yourself painter. Handy dispenser box makes application easy . . . cutter edge is built in!

TO PROTECT WALLS when painting woodwork, use "SCOTCH" Masking Tape. It sticks tight at a touch—paint will not bleed through. And it strips off clean leaving a neat edge.

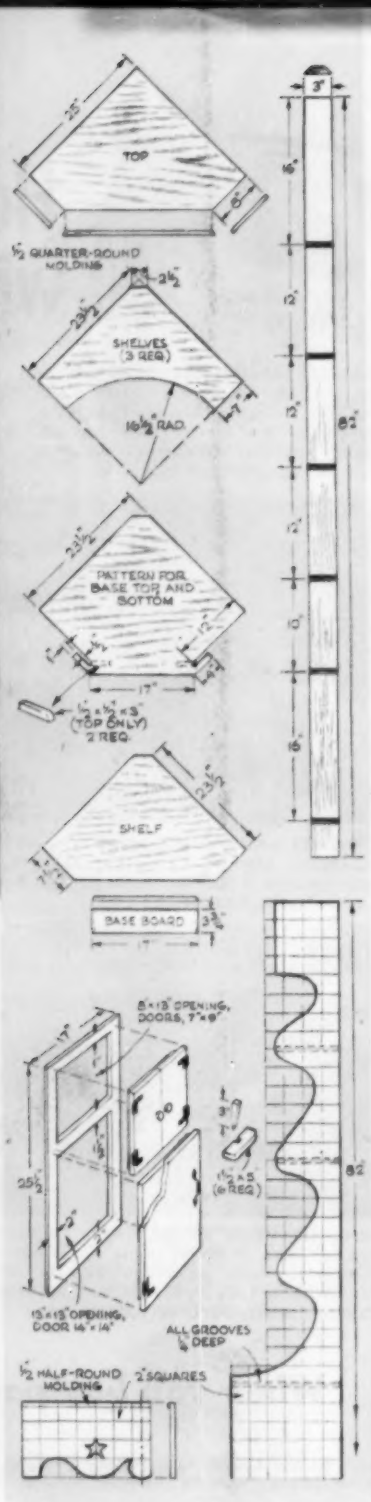
TWO-COLOR WORK IS EASY with "SCOTCH" Masking Tape. It makes home paint jobs look professional—color separation lines are always arrow-straight. Too, its flexible backing stretches to conform to irregular or curved surfaces.

STOP PAINT SPILLAGE ON BASEBOARDS and floors with an "apron" of "SCOTCH" Masking Tape and paper. It saves muss and bother—can be applied before painting in far less time than clean-up takes *after* the job.

(BONUS TIPS) "SCOTCH" Masking Tape is ideal for sealing bags and cartons of clothing going into storage. And it's a perfect "clamp" on glued parts while the glue is setting!

When you buy paint . . . buy **SCOTCH** BRAND MASKING TAPE

Brand Pressure-Sensitive Tapes, "SCOTCH" Brand Magnetic Tape, "3M" Adhesives, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-slip Surfacing. © 1955 3M Co.



How to build a corner cabinet

WITH its sides set at right angles to the walls, this corner cabinet offers more shelf space than a triangular-cross-section cupboard taking equal wall space.

Cut the sides, backstrip and framing member for the doors from ¾" interior plywood. All other parts except the half- and quarter-round molding strips and the mortise and pin "joints" are ½" plywood.

The enclosed-section top and bottom shelves interlock with the sides, adding rigidity to the assembly, which is glued and bradded together. Finishing nails toed through the sides and into the floor, as well as through the backstrip and into the wall, hold the cabinet in permanent position. Use offset H-L hinges to hang the lapping cupboard doors.

DO-IT-YOURSELF
easier . . . with these
3 COSOM PRODUCTS

THE *NEW* **TAPE RITE** ALL-PURPOSE TAPE APPLICATOR

T-200

For masking tape as used in industry or in the home. Holds 60 yards of ¾" masking, paper, or freezer tape.....each **$2.39**

T-150

For any pressure sensitive tape ⅜" to ¾" width on a 1" core. More accurate application of tape for the home or office.....each **$ .69**

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1" x 4"

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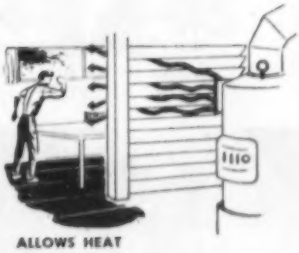

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the most amazing NEW power tool
in years . . .

Porter-Cable's revolutionary

ROUTO-JIG!

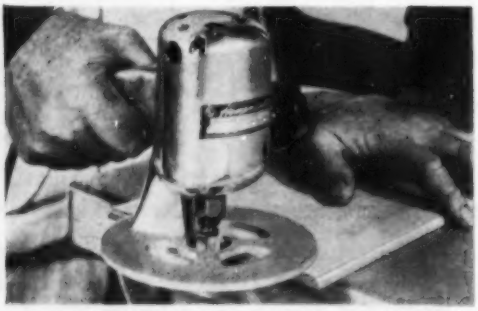
Portable jig saw! High speed router! Precision shaper! You get all 3 in this low-priced quality tool!

Just convince yourself—see *and try* the sensational tool that puts dozens of new skills at your fingertips! Use the versatile new Routo-Jig as a portable jig saw, for cutting intricate contours and freehand shapes, for fast, accurate plunge cutting. Use Routo-Jig as a portable router, for mortising, grooving, dadoing, rabbetting. Use Routo-Jig as a shaper, with its own precision table —for moulding, beading, joining.

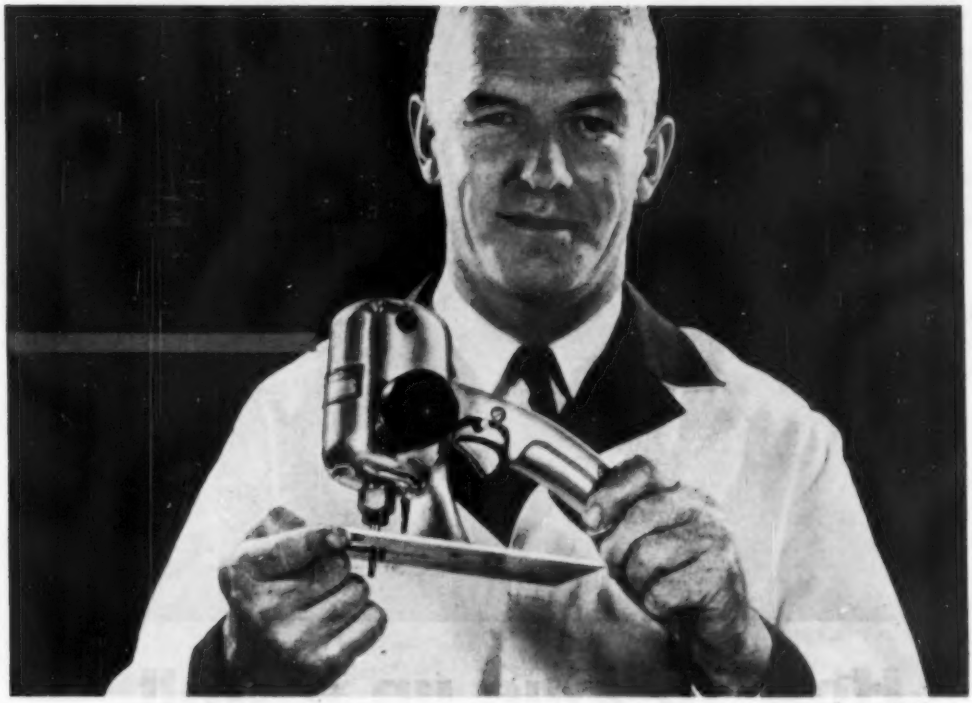
You'll find hundreds of money-saving uses for the Routo-Jig in your workshop and around your home—in cabinet work, furniture and toy making, home improvements of every kind. You'll do work of truly professional quality, faster and easier than ever before!

Like every Porter-Cable tool, the Routo-Jig is *quality-built* for years of dependable service. Right now, your dealer makes you the special introductory offer described on the opposite page—*saves you a cool $7.00.* Read about it—see him today!

IT'S A JIG SAW! Routo-Jig is a new kind of portable jig saw with *rotary* action—for intricate contours or straight cut-off work in wood up to 1" thick. No starting hole required. Sturdy cutting bit reduces blade breakage to a minimum.



IT'S A ROUTER! Routo-Jig converts to a high-speed, efficient portable router in *seconds!* Special bits available for fast, easy work in wood, plastics, compositions. 24,000 R.P.M. speed for clean, smooth, *finished* cuts in every application.



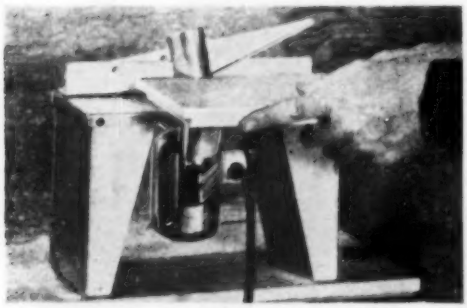
Limited time only — Special introductory offer saves you $7.00

List price of the Model 140 Routo-Jig with jig saw and router bases is $49.95. Model 5020 Shaper Table, regularly priced at $12.00, is yours for *just $5.00 additional* during the introductory period!

a $61.95 value for only

$54.95

See it demonstrated at your dealer's— or mail coupon today!



IT'S A SHAPER! Husky accessory Shaper Table makes Routo-Jig a precision Shaper and Joiner. Quick, accurate, professional results on difficult rabbet cuts, moulding cuts, joiner work. Adjustable fence, built-in safety guard.

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Yes, send me a complete catalog sheet on the Model 140 Routo-Jig, and the name of my nearest dealer.

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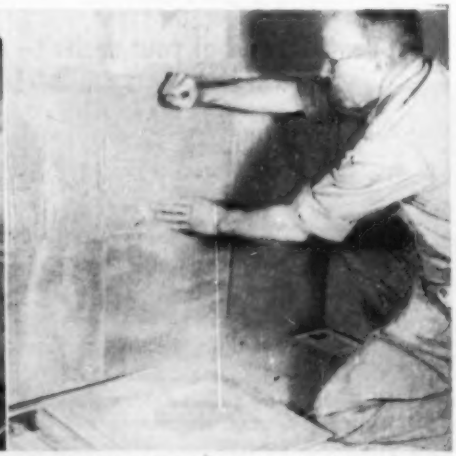
How to glue up a wall

YOU can panel a whole room without a single nail by using contact cement. With this, you can apply sheets of plywood, metals, plastics and other materials to walls with less muss than putting on wallpaper.

With a glue job, you have no nail

[*Continued on page 262*]

CHALK LINES show you where to spread glue, are laid out here 16″ apart, level and plumb, to match 16″ plywood squares. If starting corner isn't plumb, trim squares to fit first.



PRESS SQUARES IN PLACE after brushing 2″ strips of cement over wall lines and around edges of plywood, with dab in center of each square. Put on two coats and let set 30 minutes.

IDEAS-

and Plans for Your

GARAGE

Here's a 32-page Plan Book that includes 12 smart garage designs and sensible floor plans, how-to-build instructions, material lists, driveway sketches, etc.

Plans provide for the 9′ wide Strand Garage Door (gives you a full 12″ of extra width; saves banged up fenders!). This popular all-steel door will stay new *for a lifetime;* you get permanently easy operation. No warping, swelling, sagging – ever. Strand doors are galvannealed with a heavier, hot-dipped zinc coat for rust protection and clinging base for paint.

You get *big* savings, too. Low first cost – because of huge production. Lowest installation cost, because of one-piece door leaf and factory-assembled hardware. See Strand 9′ x 7′, 8′ x 7′ and 16′ x 7′ doors – at your lumber dealer's.

Plan to do it yourself?

Strand is the quickest, easiest of all doors to install!

STRAND

All-Steel Galvannealed

GARAGE DOORS

Strand Garage Door Division
Detroit Steel Products Co., Dept. PS-9
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☐ Please send 32-page booklet of Garage Plans and Ideas. I'm enclosing 10c for postage and handling.

☐ Please send free 12-page booklet showing how to modernize my garage.

Name _____

Address _____

City _____ Zone _____ State _____

ON NEW CONSTRUCTION, you can cement panels directly to wall frame. Here squares are braced with cross strips notched into studs. Keep dust off cement or it may weaken bond.

PUT UP BIG SHEETS by leaving a ¼″ gap in the cement along one edge. Pivot this glueless edge against nails in the backing strip, then swing the panel against the wall.

TAP PANELS at all contact points with a block and hammer to insure a firm bond. Remove nails and use edge of first panel as a pivot to swing the next sheet in place.

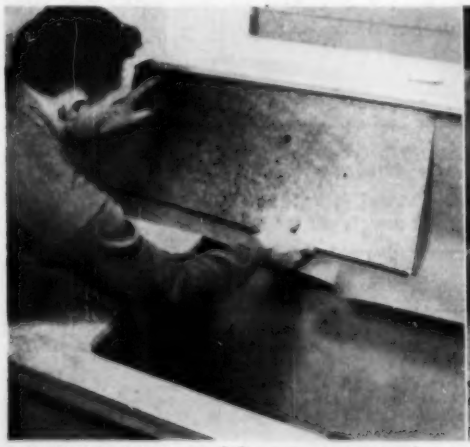
[*Continued from page 260*]

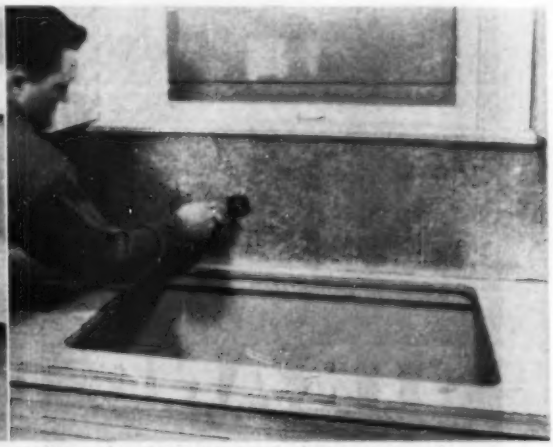
heads to set and fill. You slap up a sheet and it stays stuck. Then there are other materials, like these small plywood squares and aluminum sheet, that you couldn't nail adequately no matter how careful you were. Contact cements put them up as fast as you can press them in place.

These synthetic stickums are readily available at hardware stores under various brand names. Just be sure that you ask for the contact type. All are basically the same, but to be certain of good results, follow directions on each can.

The trick is to coat both the wall and the material that you're putting up. When the two surfaces meet, they bond instantly. This means that you have to be careful to get the pieces up right the first time, because a second try is harder.

If something does go wrong, you can loosen the cement with its own solvent or with lacquer thinner and start over again. But don't just try to pry the pieces off—the wall may come loose before the cement.





ALUMINUM SHEET, used here to waterproof a kitchen backsplash, can be glued up just like wood. Brush both wall and aluminum with two coats of cement. To keep the aluminum from sticking, slip wrapping paper between it and the wall (left) until you have the sheet perfectly placed. Then slide the paper out and roll or press the sheet on firmly (right).

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BUILDING PRODUCTS DIVISION, LEXINGTON, KENTUCKY

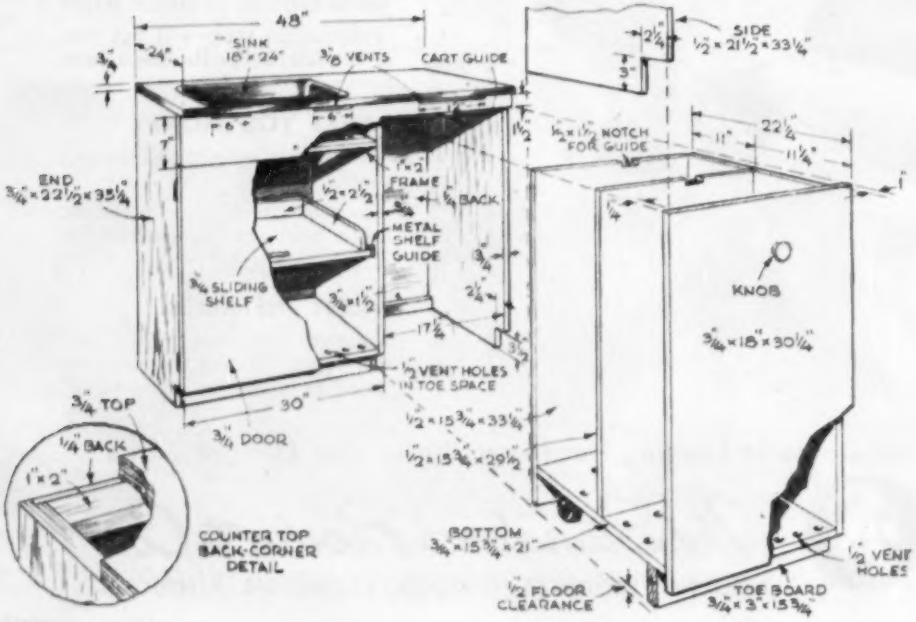
How to build a laundry center

THIS useful laundry center might be installed in either a utility room or basement. The roll-out cart for soiled clothes has two compartments—one for white, one for colored things.

Build the base cabinet around a standard sink (about 18″ by 24″), using exterior-grade plywood. Cut the cabinet panels, sand the edges and assemble with glue and nails. Fasten down the top, cement plastic counter topping over it and install the sink and faucets. Whether the sliding shelf is practical depends on the location and direction of the trap.

Cut the parts for the cart after the cabinet is completed and set in position against the wall. This way the cart will be certain to fit. Buy four rubber-wheel casters and shim them with wood, if necessary, to raise the cart bottom 3½″ from the floor. Sides shown in the drawing (not in photo) extend to ½″ above the floor, completely enclosing the casters. Simple wall cabinets or open shelves can go above the base unit.

For the finish, seal the plywood with flat undercoat and cover with gloss enamel of the desired color. A natural blond finish can be applied by brushing on a thinned coat of interior white paint followed by a coat of clear shellac.



Make all the storm sash for a 6 room house in one weekend

Reynolds Do-It-Yourself* Aluminum Sash Sections with New Corner Locks Make Job Faster and Easier — Make Stronger, Better Looking Storm Sash

You literally *snap* this new type of Reynolds Do-It-Yourself Storm Sash together . . . yet they fit more perfectly, are much stronger than ever before. With a little quickly gained experience you can complete a storm sash unit in half an hour. Light weight, non-rusting, never need painting.

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Look for this rack at your dealer's!

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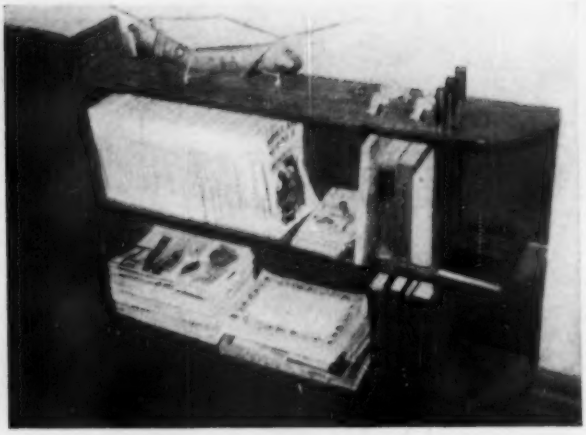
Sept—PS—No. 10

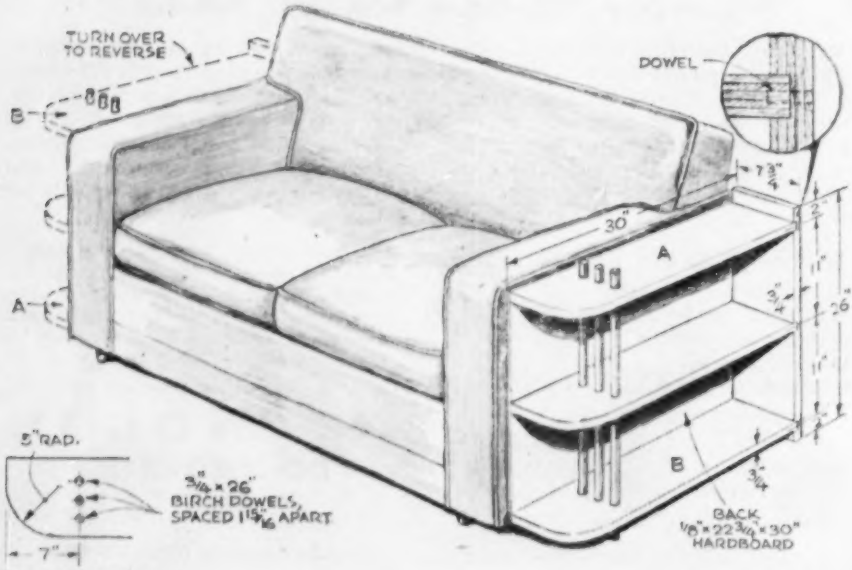
How to build a turnover bookcase



HERE'S a turnover bookcase that can be set up on either side of a sofa, or used in any corner of a room.

To form the shelves, clamp three 29⅝″ lengths of 1″-by-8″ plywood together, round off one corner of the stack, and bore ¾″ holes for three dowels which space out the shelves at the exposed end of the bookcase. Next cut a 26″ length of 1″-by-8″ plywood for the upright at the opposite end. With a saw and chisel, or a dado head, mortise the inner face of the upright to take the three shelf ends. For additional strength, drill holes for dowel pins. Cut three 26″ lengths of ¾″ birch doweling and turn or carve glue grooves around each dowel where they will be hidden by the shelves.

When assembling the bookcase, glue the shelves to the solid end first. Then tap the long dowels down through the mating holes in the shelves, dabbing glue around the grooves just before they are driven into final position. Square up the case and glue and nail a piece of hardboard to the back. Finish to harmonize with other furniture in the room.



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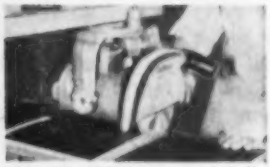

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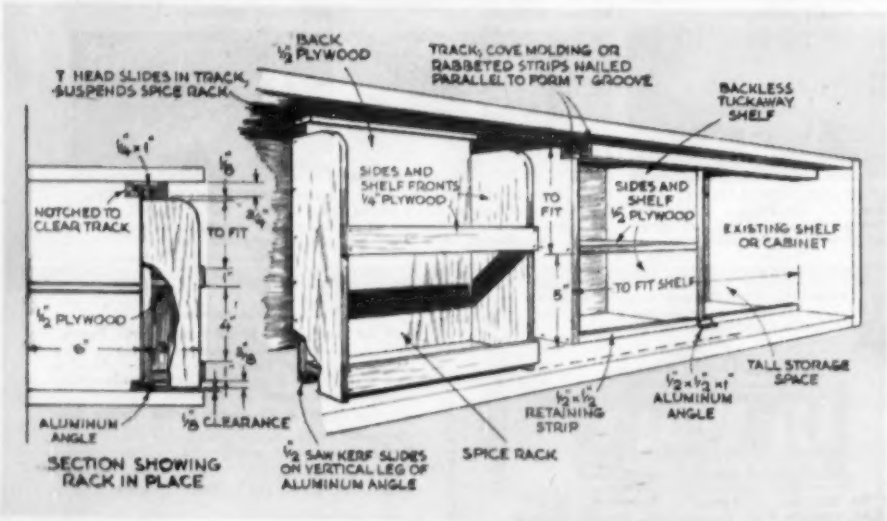
How to build a sliding spice rack

CONCENTRATED storage . . . that best describes this sliding spice rack and storage shelf. The assortment of small spice cans that accumulates in every kitchen fits neatly in the sliding part. Behind it, yet easily reached by sliding the rack to either side, larger jars and bottles can be stowed.

Make the rear storage shelf first and fit it in the cabinet. The space between the shelf and end of cabinet should be equal to shelf length. Nail a retaining strip along the bottom to keep the front clear for the sliding rack. The track is two pieces of cove molding screwed to the underside of the shelf above.

Assemble the sliding rack as a complete, separate unit. Nail and glue a strip of ¼″ plywood along its top edge to form a T to fit in the track groove. Before the sides are in place, cut a saw kerf ½″ deep in the bottom of the back to slide on a 1″ length of ½″-by-½″ aluminum angle, which guides the rack.

Seal the plywood with flat undercoat and finish with enamel. Rub the underside of the T strip with paraffin wax, and drive a rubber-head tack into the shelf at the open end of the track to limit the travel of the rack.



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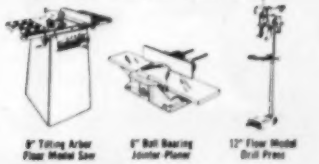
OTHER SHOPMASTER TOOLS



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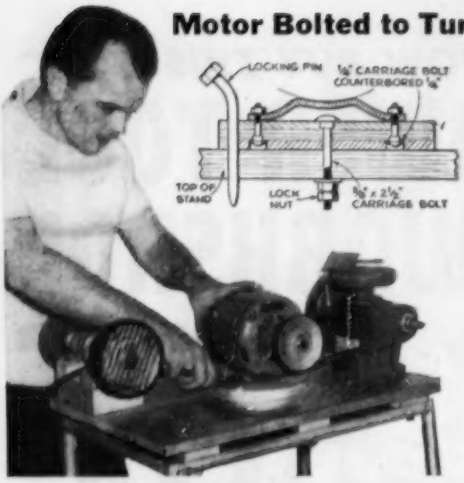
Motor Bolted to Turntable Can Power Two Tools



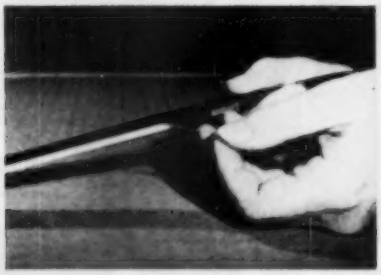
A SIMPLE turntable enables you to power two tools with a single motor. Just pull the locking pin out and swing the turntable around. The belt can then be easily disengaged.

The turntable is a ¾" plywood circle fitting the motor base. It pivots on a carriage bolt through its center. Mounting holes, counterbored on the underside, are positioned to match the motor base. Bore the pivot hole through both turntable and bench top, mounting holes through the turntable only.

The locking pin—a ¼" bolt with threads ground off and point tapered—fits in another hole, bored after the unit is assembled. Test for position of the parts before bolting permanently.

DO IT THE EASY WAY

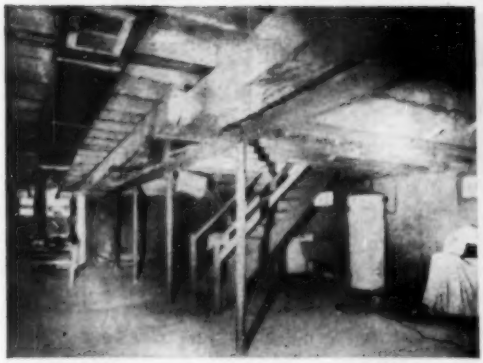
NO NEED TO HUNT UP A SQUARE if you are using a backsaw to cut narrow pieces of wood. Use the saw itself as a square.



LACK A SAFE-EDGE FILE? Improvise one by applying a narrow strip of tape over the edge teeth when these are likely to cause damage if the file slips sideways.

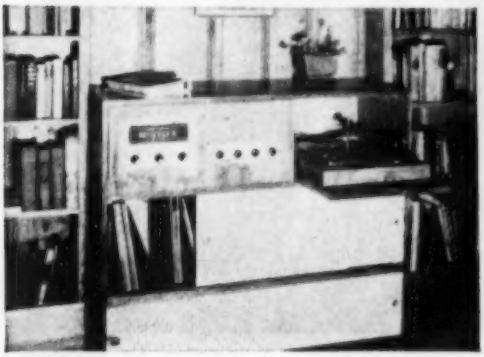
TO APPLY SHOE POLISH, use an old powder puff instead of a piece of cloth, which tends to roll up and smear your fingers.

DOES YOUR WINDOW-SHADE ROLLER pop out of its bracket because it's too short? Lengthen it by pulling pin out a bit.



BEFORE—a typical unfinished basement with valuable space going to waste. But suppose we panel the walls with easy-to-use Weldwood . . .

AFTER — see what a difference Weldwood makes! Weldwood Novoply® walls make it a beautiful, practical children's playroom.



Hi-Fi unit, shown in book, is Weldwood knotty pine with perforated hardboard sliding doors. Holds tuner, amplifier, changer and records.

Handsome chest-on-chest, featured in book, is easily made of birch and walnut or other Weldwood Hardwoods such as cherry, oak or mahogany.

NEW! Big 40-page Do-it-Yourself book by Weldwood shows you

how to wood panel a wall • how to make a plastic laminate sink top how to saw and work plywood • how to finish plywood • how to make a hi-fi housing what to do about a "problem" basement • how to glue plywood—and has all kinds of tips for the homecraftsman • *Plus* dozens of pictures of finished projects!

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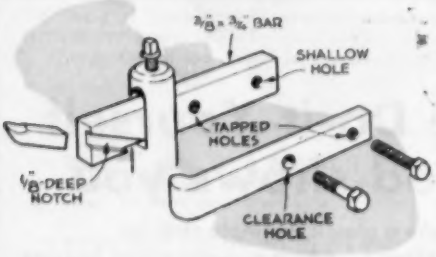
NEW Shop Ideas

Bandsaw Tilted on the Run. Cutting form blocks at constantly changing contour angles used to be a three-man job at the Temco Aircraft Corporation in Dallas. One man guided the material, another called out angle changes from a level and protractor, and a third tilted the table accordingly.

Form-block maker W. D. Smith made it a one-man operation by installing a telescoping leg on a Do-All bandsaw as shown. It consists of a threaded shaft, hinged to the outer table edge, that slides inside a length of tubing pivoted on a floor plate. A handwheel with a threaded hub rests on a thrust bearing atop the tubing.

The table lock is tightened only enough to prevent accidental movement. Angles are read on the degree scale and the table tilt changed with one hand while the work is fed with the other. The leg permits a maximum tilt of 47°.



Holder Salvages Bits. Broken or short-ground ends of high-speed bits too small to grip in a regular holder can still do good work if clamped in this one.

Mill an inclined notch at one end of a ¾"-by-¾" bar to fit the bits. Tap a hole about midway. Bend an offset end in a heavy clamping bar so that the rest of it will clear the tool post. Drill a clearance hole opposite the tapped one in the body, and tap a second hole at the far end. By tightening two bolts against each other, the bit can be securely clamped in the notch.—*Federico Strasser, Santiago, Chile.*

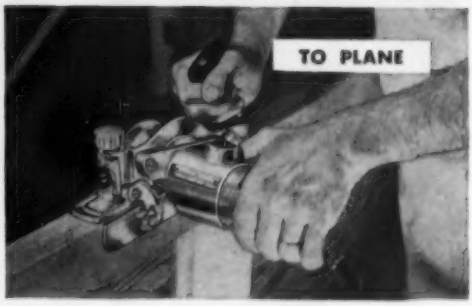
Clamps for Round Work. A two-piece cable clamp makes an efficient hold-down for rod or tubing on the workbench or drill press. Its curved gripping surfaces make it possible to hold even thin-walled tubing without distorting it.

A fixture for drilling a row of holes along such work can be made by mounting two clamps on a straight board. With the stock in place, the board is slid along a guide on the drill-press table to make successive holes in line.—*J. M. Finn, Pittstown, N. J.*

 Please turn to page 274 for more shop tips

The Right STANLEY Tool

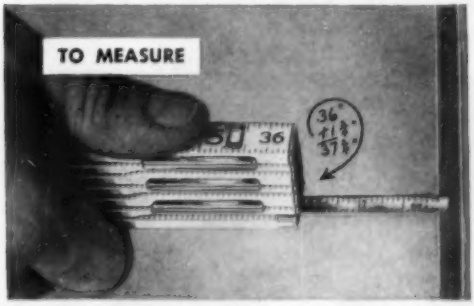
The rugged little work horse of the workshop in 90% of your woodworking jobs. Versatile, light weight and high speed, its motor is used to power the plane shown. *H15 Router — $39.95.*



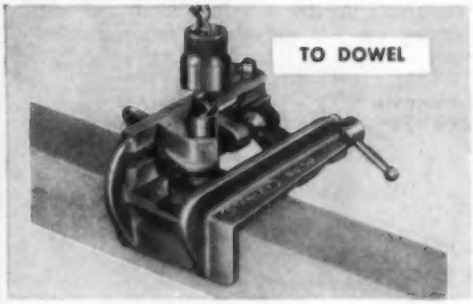
This tool is a wonder for smooth and easy planing. Just right for fitting storm and screen doors and windows, trimming wood, plastic or aluminum veneers on table and counter tops. When you have H15 Router, Kit is all you need to convert to power plane. *H106 Plane Adapter Kit — $29.50.*

New! Router-Plane Kit

Combines H15 and H106 with gauge and bit in handy fitted carrying case. *H100 — $89.95.*



Accurate measurement is fundamental in jobs of all kinds. Here is a new Stanley Zig-Zag Extension Rule with accuracy-plus features. Extra thick first leg has brass slide for inside measurements. Rule opens to even numbers, convenient marking gauge at 2", 4", 6", 8", etc. Plastic finish on sticks and nickel silver joints ensure longer useful service. *6 ft. No. X246 Extension Rule — $2.10.*



Joining two pieces of wood together is one of the first jobs a woodworker masters . . . and it isn't really *mastered* until you do it with dowels. Here's a jig from the Toolbox of the World that makes good doweling easy. With it you can bore holes accurately in edge, end or surface of wood. 6 guides for 3/16 to 1/2 inch bits and depth gauge furnished. No. 59 Doweling Jig — $5.95.

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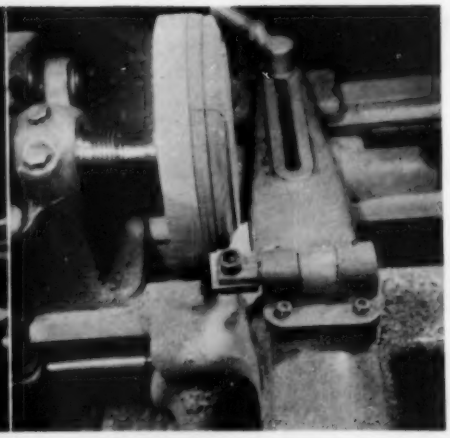
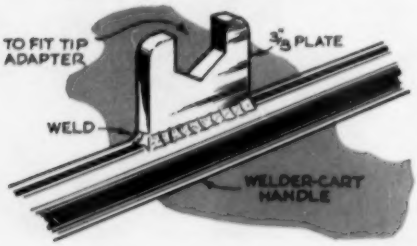
MORE SHOP TIPS



Turnings Match Moldings. You can turn bases, rings or segments to an exact match for moldings by using your molding cutters on the lathe.

To mount a one-piece cutter, cut an old auto brake rod off about 5″ from the clevis or fork. File or turn the shank to fit a boring-bar holder. Spring the clevis to receive the cutter and file the inside faces smooth. Lock the cutter in with a ½″ cap screw and nut, setting one cutting edge exactly at lathe-center height, as shown at the left above.

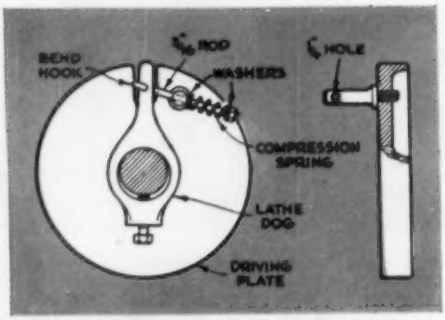
One blade of the type used in circular-saw cutter heads can be mounted as shown at right above. Turn a piece of ¾″ square or key stock to fit the boring-bar holder, leaving enough square at one end to clamp the cutter in. Slot this end to suit, drill across the slot with an I drill, open out on one side of the slot to $\frac{5}{16}$″, and tap the other for a $\frac{5}{16}$″ hollow-head cap screw.—*H. L. Luckett, San Antonio, Tex.*



Hex Rest Is Welding Aid. Finding it hard to change tips on my acetylene torch without loosening the adapter at the same time, I welded a notched plate to the welding cart. Dropped into the notch, the hex section of the adapter is firmly held while I turn the torch tip with a wrench.

To remove the entire tip assembly, no wrench is needed. I simply drop the hex into the notch and twist the torch body.—*Ken Hadenfeldt, Storm Lake, Iowa.*

Rustproof Storage. To keep small parts free of rust, put them into a polyethylene vegetable bag along with a squirt of sewing-machine oil. Twist the neck of the bag tightly and hold it with a rubber band.



Spring Tightens Lathe Dog. Play between the tail of a lathe dog and the slot in the driving plate can ruin a thread. Jamming in a wedge or shim may force the work off the live center. This spring retainer will keep the dog against the driving edge of the slot without forcing the work out of line.

Tap a hole near the slot and turn and thread a post to fit it. Tighten the post in the hole and mark the cross hole for the hooked rod. Make the rod a free fit in the hole, thread the straight end, slip on a compression spring, and use a nut to adjust tension.—*H. J. Gerber, Stillwater, Okla.*

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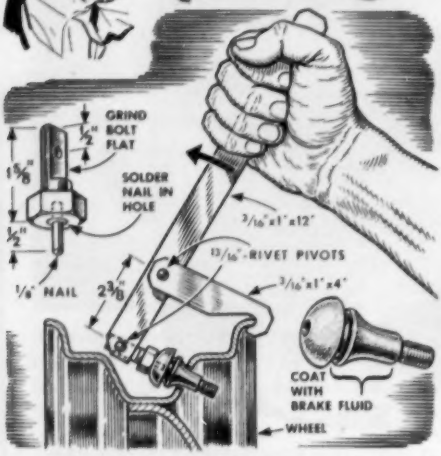
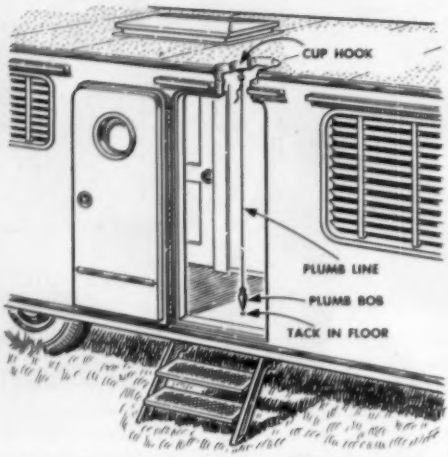
City.....Zone.....State.....

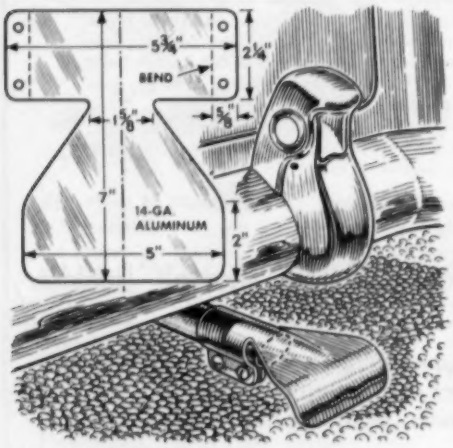
Hints FROM THE MODEL GARAGE



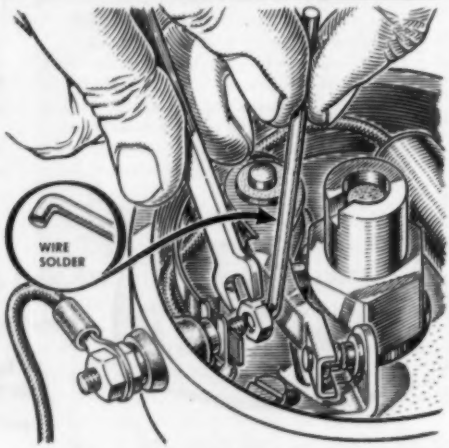
Improvised lever tool, assembled from steel strips, applies straight, firm pressure to insert tubeless valves in wheel holes without damaging them. The hook acts as a fulcrum against the wheel rim, and pressure on the long end of the handle is multiplied at the short end. Application of brake fluid makes insertion easier.



Set up a trailer once with a carpenter's level to install this leveler. Then suspend a plumb line from a cup hook screwed into the ceiling and drive a tack into the floor beneath the point of the plumb. All future leveling can be done by hanging the line on the hook and shifting the trailer until the plumb bob hovers over the tack.



Made from one piece of 14-gauge sheet aluminum, this exhaust deflector will remain bright and rust-free while it directs hot exhaust fumes down toward the ground. Clamp it to the tailpipe with two bolts and bend the outer end down slightly.



A piece of wire solder will guide a small nut onto a bolt where your finger can't reach. Thread the nut part way on the soft solder and place it against the bolt end, where a wrench can turn it off the solder and onto the bolt.

 Please turn to page 278 for more auto hints

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non-breakable fiber-glass handle

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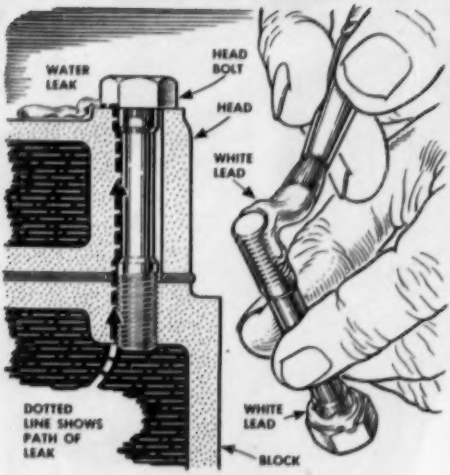
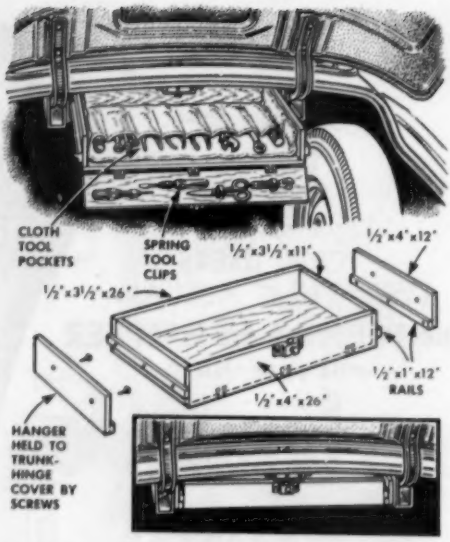
MORE Hints from the Model Garage

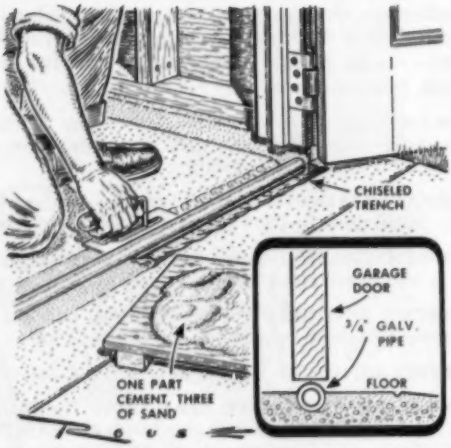


Don't blame the head gasket when traces of water or antifreeze appear on top of a cylinder head. Chances are that the fluid is seeping up along the threads of a head bolt. Stop the leak by removing the bolt and coating the threads and shank with white lead or gasket cement.

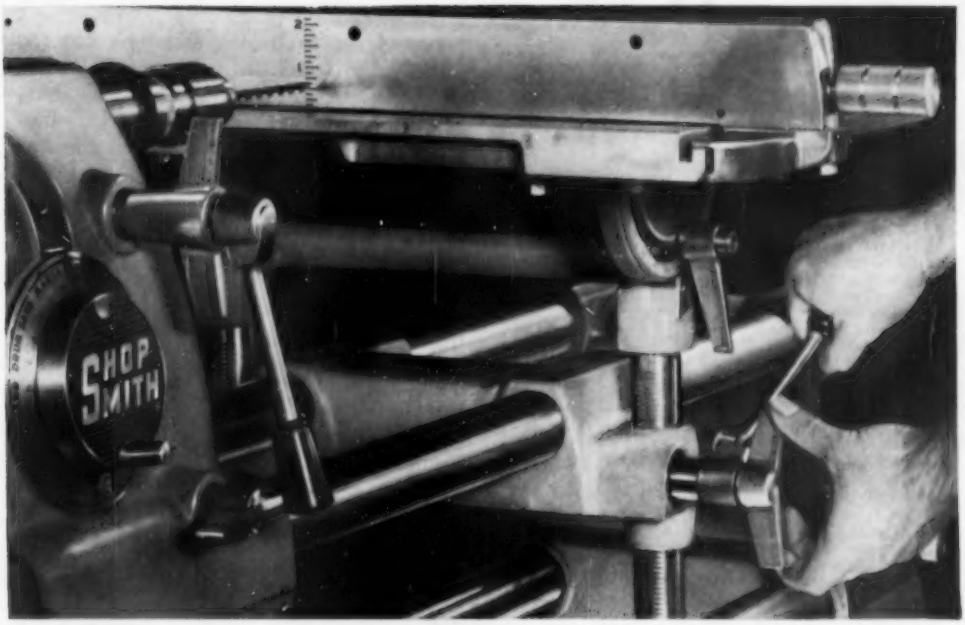


Tools won't rattle or be in the way if they're stowed in a space-saving drawer like this one built to fit between the rear-deck hinges. Fasten wood side rails to the hinge covers with self-tapping screws and fit a cupboard catch to the drawer front to keep it from sliding.

Put finishing touches on a polish job by cleaning up any mess made by the polish. Clean wax smears off windshield with glass cleaner for better vision at night. If polish is spilled on upholstery, allow it to dry then brush it out. If spot remains, rub lightly with soapsuds.



To keep rain, leaves and dirt from blowing under your garage door, install a length of galvanized pipe across the threshold. Chisel out a trench from jamb to jamb about half the diameter of the pipe, lay the pipe in place and trowel concrete flush with the floor on both sides.



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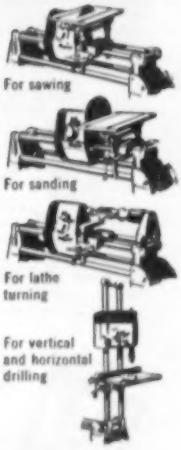

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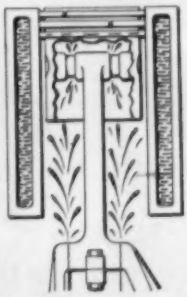
Care and Feeding of Engines

BY S. P CORP

SEATING NEW RINGS

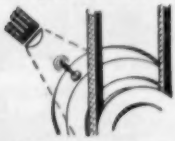
Even the best re-ring job depends, for enduring satisfaction, on how the engine is driven during break-in. When the engine is started for the first time with new rings, it should be accelerated quickly to an engine speed equal to 25 to 30 mph. This insures getting plenty of oil up onto cylinder walls and rings. Keep engine at this fast idle until it reaches normal operating temperature. Do not allow engine to idle at low speed during the warm-up period, and never run cold water through the radiator while seating new rings.



After engine is warmed up, drive car in low or second gear, to insure good lubrication and reduce load on compression rings. Accelerate in second gear to 35 mph, then drop back to 25 mph. Continue for 10 minutes. High idle speed with a light load as in second gear prevents overloading pistons and rings. Drive at 50 mph for first 200 miles.

TIMING WITH HIGH OCTANE

If the timing of your engine hasn't been checked lately, this should be done to make sure it is within manufacturers' specifications. With high octane gas, timing may be advanced, but only as specified. If you use high octane continuously, advance timing until a slight detonation is heard when you accelerate in high gear from 19 to 30 mph. Now retard timing just enough to eliminate the detonation, then idle and check for smooth operation. For economy, engine should be timed for the type of gasoline you use.



WRITE FOR FREE MANUAL

For professional suggestions on car care, send a postal card for your free copy of Sealed Power's new illustrated manual, "Care and Feeding of Engines." And when you re-ring, be sure to use Sealed Power KromeX Ring Sets—for fast break-in, for immediate oil economy, and for double ring life. They are the best ring sets built, proved in millions of road miles. Sealed Power, Dept. H-9, Muskegon, Mich.

Sealed Power

PISTON RINGS

[*Continued from page 190*]

moved the exhaust stack, took out the studs and freed the cylinder. He pulled it from the piston, exposing the valves. With long-nosed pliers he reached into the inspection hole and pulled the key from the broken-springed valve stem. As he pulled the valve up out of the guide, the spring rolled across the floorboards in two segments.

"I WONDER," Elmer called out, the wind whipping his words away, "how far we are from shore? Get to bailing, Pete. Water's gaining on us."

Gus ducked under the canvas again, thinking about that mile of sheer cliffs, where they'd have no chance if they struck. Why, he asked himself, didn't we bring along our spare six-horse motor this morning? But why should we? The lake was like a mill pond when we started out and the three-horse job is best for trolling. We're babes in these woods, I guess. How far from shore . . . how much time do we have left? Suddenly, Gus reached out and dragged his fishing-tackle box under the canvas.

"Hey," Pete yelled, a few minutes later, "we're close to shore. I can hear the wind in the pines."

Gus came out from under the canvas. His flashlight beam lanced out through the heaving blackness, revealing cliffs that stood straight up from the water, angry waves foaming at their base, exposing jagged rocks.

"Good heavens!" Pete breathed. "We'll be cut to bits."

Gus grunted as he swung the motor outboard and clamped it firmly in place, opened gas petcock and air vent.

"Try her, Pete," he said. "You know her better than I."

"Try her!" Pete echoed. "You didn't . . ."

"Maybe," Gus said. "Try it, man."

PETE shut the choke, cracked the throttle, pulled the starter cord, once, twice, three times. The motor coughed, staggered, cleared its throat and hit

[*Continued on page 282*]

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- And KIMSUL is clean—free of irritating dust and slivers.
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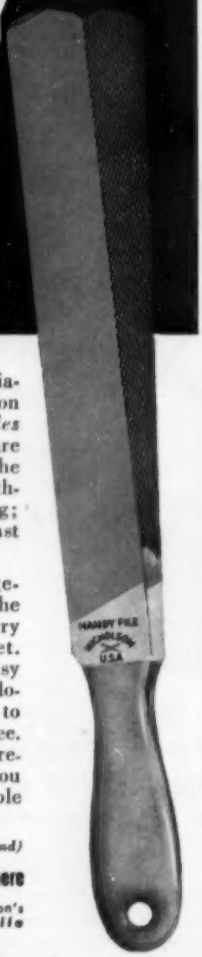
HANDY FILE

TWO FILES IN ONE:

DOUBLE CUT ON ONE SIDE—SINGLE CUT ON OTHER SIDE



Like those inseparable Siamese twins, the Nicholson HANDY FILE is *two files in one.* Either or both are always at hand . . . in the single-cut side for smoothing and edge sharpening; the double-cut side for fast stock removal.

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Gus Takes to Water

[*Continued from page 280*]

smoothly. Glancing at the rocks close aboard now, Pete opened the throttle wide. The motor didn't respond. It sputtered, loaded up, began to die. Gus shut the throttle to slow.

"Easy does it," he said. "That valve spring is too weak to take it fast—slow and steady now, to pull us away."

IT WAS touch and go there for a few minutes, but slow and steady did pull them away, down to the end of the cliffs and to a sandy beach. With the boat propped three-quarters over on sticks to form a shelter, and a roaring fire reflecting heat, the battle of the lake seemed never to have been.

"This is the life," Pete commented, turning a slab of pike on a forked stick over the fire. "Now tell us, Gus, how you managed to fix that broken valve spring. Seemed impossible to me."

"It was impossible," Gus admitted. "But you know those heavy piano-wire leaders we brought along for muskellunge? I wrapped one of those leaders around a screwdriver that had a shaft a bit larger than the bottom end of the valve guide. The spring I made was too weak to close the valve fast enough for any speed—that's why she died when you opened the throttle."

"But it was fast enough," Pete said fervently, "to claw us off those cliffs. If we'd hit there we'd have had it."

"You can say that again," Elmer agreed. "I'm glad you didn't tell me about those cliffs, Gus, out there on the lake. I'd have been scared to death."

"I was," Gus said, and he meant it. END

NEXT MONTH: Gus starts the music.

Whistle Stop

The silver-haired old lady in the ancient car drove down the wrong side of the road, went through a red light and, to make matters worse, ignored the efforts of a traffic cop to stop her.

"Didn't you hear my whistle?" the cop demanded angrily.

"Yes, I did, officer—but I never flirt when I'm driving."

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IN CANADA: ALVAR SIMPSON LTD., TORONTO 12.

Super Circus Act Builds Super Roads

[*Continued from page 161*]

The operative word is "team"; the guys in a spread have to work together for months before they really click. A spread that can lay down six or seven thousand feet of pavement a day is a showy sight. It can remind you of a drill team or even a chorus line; there's the same easy coordination and mutual trust, the same instinct for avoiding snafus.

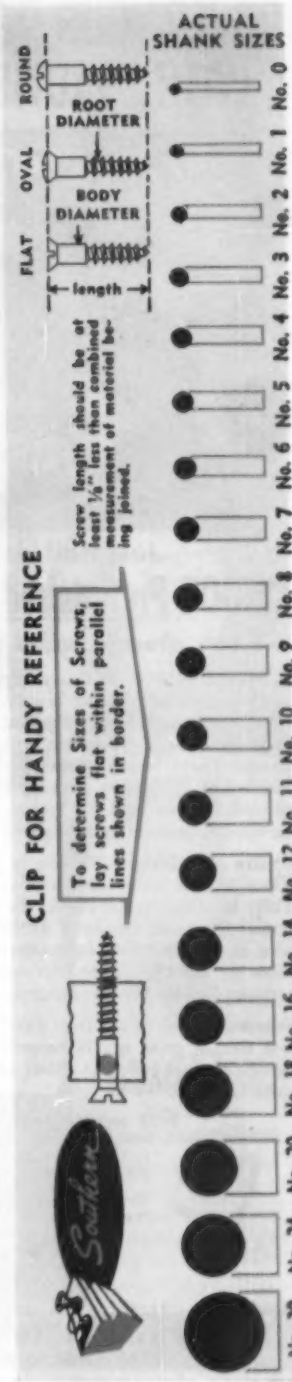
Because wet concrete ticks away like a time bomb, snafus are dangerous. If one truck driver delays the nicely timed arrival of cement, sand, aggregate and water; if one of a score of Rube Goldberg machines konks out; if one hand-finisher slips up on his troweling; if a rain cloud sneaks up and pulls the plug before the new-laid surface can be safely covered; or if some hard-boiled inspector doesn't find the right percentage of entrained air* in the mix, you can "lose a slab." This is an expensive development, certain to inflame the boss.

Logistics. The interval that each batch of ingredients must spend in a mixer is fixed, and establishes an overlying limit on spread speed. Nothing can be allowed to extend it. Big mixers are incredibly hungry, requiring a whole fleet of heavy trucks to orbit unceasingly from the batch plant where they pick up their measured loads to the big loading "skips" on the mixers. If a truck breaks down (it's not uncommon, with big loads toted on rough surfaces), nobody tries to repair it until it is pushed out of the way, into the ditch if necessary. *Nothing* slows a spread that can be helped. A spread may soak up $600 an hour in labor cost alone, on top of which are intense timetables and weather-betting pressures.

When a spread clanks up to a bridge or overpass, bottlenecks make trouble. The whole operation is a kind of portable traffic jam anyhow, and in close quarters things get messy. You need a one-way loop for batch trucks, including some way they can *back* up to the skips; a great water truck linked umbilically to

[**Continued on page 286**]

**It's important: it affects concrete's resistance to "scaling," an unpleasant skin disease of middle-aged highways.*



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Right hand column provides easy way to measure wood screws—check size you need here. For helpful Wood-Tapping-Machine Screw Technical Chart and "How Are Wood Screws Made?" write Box 1360-P2, SOUTHERN SCREW COMPANY, Statesville, N. C.

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[*Continued from page 284*]

the mixers, and space for another water truck to come and replenish the first one; you need to set aside one side of the lane for reinforcing steel; and you can't cross over the freshly poured lane.

Ducking headaches. One OT contractor experimented with "wet-batch" paving. Somewhat like the transit-mix dodge used on smaller jobs, this eliminates mixers and water trucks at the paving site. It calls for two huge mixers back at the batch plant and a fleet of special trucks to rush the freshly brewed mix to the spread.

It also involves nerve-wracking control problems: 30 minutes is the longest the mix may be left in a truck. If one should break down en route and be unable to dump its load, it might ultimately have to be emptied with jackhammers. And if one of the paving machines should poop out, there'd be a whole queue of trucks full of setting concrete and no place to pour. None of these nightmares occurred on the "wet-batched" section of the road, but it took a fancy radio network and even a spotter plane to guard against it.

Once concrete is poured and cured, the showy part of road-building is done. Not that the work is done, though. A crew comes along and saws up the slab, injecting black filler in its wounds. Another crew paves the shoulders, cursing the exacting standards for elevation and watertightness at the juncture. Whole groups of crews work over final grading of cuts and fills, planting and sodding, trying to get the jump on erosion.

Then, finally, comes the anticlimax everyone has been aiming for, when the police-escorted politicos whistle through on Opening Day. END

The Height of Audacity

1st Boy: My father's brave. He killed five lions and an elephant in Africa, single-handed.

2nd Boy: That's nothing. My father bought a red car when my mother wanted a blue one—*Youngstown Kitchens Merchandiser.*

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How Government Sleuths Will Cut Static

[Continued from page 172]

by sheer strength. That fills the ether with signals that overlap those of other stations on the same frequencies. It resembles the wave-interference that would be created by dropping a load of gravel into a pond.

A knowledge of static levels can lead to reductions in power and help solve what is rapidly becoming an impossible traffic problem in the radio spectrum. Creating room in a spectrum where none now exists will go a long way toward improving radio reception everywhere. More precise knowledge of static will also enable engineers to build receivers designed to suppress it.

Static students are starting out with only basic information. They know that atmospheric static badly affects only those radio frequencies at 30 megacycles and below. It does not interfere with the higher frequencies, such as those used for television and short-range aircraft navigation. It doesn't interfere with FM.

They know that static is highest in the tropics because that's where most of the electrical storms are. They know that it moves north in our spring as the earth tips on its axis and the sun's heat spawns more storms in the north temperate zone. They know that it moves south in the fall. It is lightest, naturally, at the poles.

What the engineers don't know is the pattern of static by intensities throughout the world. The Bureau of Standards studies, dovetailed with those of other countries, are intended to provide that.

Only incidentally will they chart star static. While galactic noise, as it is called, has a romantic flavor, it doesn't seriously jam reception. Most star static is filtered out by the ionosphere, acting as a mirror facing the universe.

The head of the static-charting project for the Bureau of Standards is a 37-year-old engineer named William Quarles Crichlow. A native of Murfreesboro, Tenn., he escapes from his world of static once a week by playing hot licks on a tenor saxophone in a dance band.

[Continued on page 290]

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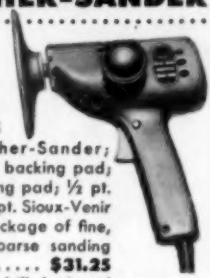

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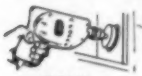

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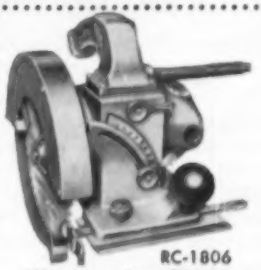

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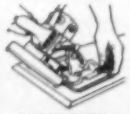

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Jacobs
CHUCKS
If it's a Jacobs it holds

How Government Sleuths Will Cut Static

[*Continued from page 288*]

That, and a spavined old Ford he calls his hot rod, are his main hobbies.

He is by nature curious, as any good scientist should be. Once he participated in a fruitless attempt to bounce a radio signal off the moon. Others were successful at it later.

He bears a jaw-breaking title: chief of the frequency utilization research section of the Radio Propagation Engineering Division of the Boulder Laboratories of the National Bureau of Standards. Radio noise studies are just one of his projects.

Now that the instrument for measuring static has been devised, Crichlow's biggest problem is getting it accepted by all the governments that may participate in the project. Static measurements are nothing new. Other countries have tried it too. But they have not had a common taw point—identical instrumentation from which common conclusions could be drawn.

The trouble with building castles in the air doesn't start until you try to move into them.
—THE SIDEWALK SUPERINTENDENT

Currently, we are collaborating with the British. Our instrument will be made available to other countries, providing mutually satisfactory arrangements can be worked out. This offer probably will even include Russia, though the Russians consistently vote no on everything in the international radio committee.

Crichlow expects that preliminary noise-level predictions will be made within a year for North and Central America on data from five stations.

Like the one in Boulder, they no doubt will be described by the layman as anything but what they are. During exploratory work for a station site in Wyoming last year, a mobile static-measuring unit was spied by one good citizen who cased the thing in an instant.

"Radar," he announced to his hearers. "It's part of our radar defense network." Nobody informed him.—*Devon Francis.*

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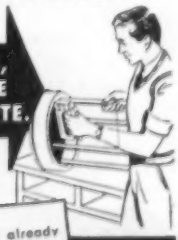

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Out Goes the Brake Pedal
[*Continued from page 124*]

gaged, yes, you stand a chance of getting smacked from behind, but little more than in a panic stop. On the other hand, an unexpected panic-quick brake application would certainly tend to unhinge you.

If you thoughtlessly abandon the accelerator to scratch your foot, you will stop fast but smoothly.

As for the effect on brake linings, Oliver Hemphill drove his Chrysler Imperial, fitted with automatic brakes, for 25,000 miles (which is the average life of brake linings) and then had an independent garage pull the wheels. The linings were only 40-percent worn. Automatic braking apparently is kind to linings because the metering system substitutes smooth application for the bang-bang of leg-muscle braking.

One aspect of automatic braking surprised and pleased me. On unannounced panic stops from high speed, riding as passengers, we didn't feel as though we were being pitched into the windshield. The metering, while lightning fast, starts the braking effort low and builds it to a maximum smoothly.

Stan Hemphill is plop in the middle of his particular line of inventive endeavor in developing his automatic braking. A huge man with a paunch that his years entitle him to, he has long been an expert on metering systems. He has to his credit 30 inventions that have made money, and a lot that didn't.

His first gold-laden idea was a way to remagnetize a Ford Model T magneto. He trotted it in to Henry Ford the Elder. Henry was fascinated but clutched his purse. He made a minuscule offer.

"No," said Stan, "that's not enough."

"I won't buy the patent," stated Henry, "and furthermore, I'm going to advise every Ford dealer in the United States not to buy the product."

It was the best kind of advertising. Every Ford dealer bought one.

When the Navy needed a pressure system for its Terrier guided missile so

[*Continued on page 294*]

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Out Goes the Brake Pedal

[*Continued from page 292*]

the delicate components would work at high altitude, the manufacturer, in desperation, summoned Hemphill. It was a Wednesday.

"I'll have it by Monday," said Stan.

"You'll never do it by then," commented the industrialist.

On Monday, Stan had three systems built. Three Terriers flew successfully.

Stan invented the steering control for the wartime B-29 bombers, the remote controls for the .50-caliber turret guns in B-17s, and the parking-brake system on the Stratocruiser.

Talent runs in the family. Oliver Hemphill, president of Hemphill, Inc., with plants in Gowanda, N. Y., Los Angeles and San Juan, Puerto Rico, is a crack pilot. A fly-boy who always bucked for fighters and always got assigned to bombers or transports, he flew 21 B-17 missions in Europe.

"Bud," as Oliver has been known since diaper days, had been recalled to service

• •

People who do things because they have to are a dime a dozen; the ones who get ahead are those who do things because they don't have to.

—THE SIDEWALK SUPERINTENDENT

• •

as a night fighter pilot when the Korean war started—and was assigned to air-transport evacuation of the wounded. When mustered out he was an instructor in a school for B-47 jet bomber students.

The Hemphill brake is on sale. The company is not straining to make it factory-installed equipment. It is wooing the "after-market"—cars that are in dealers' or consumers' hands. Present plans call for national distribution around November 1, with the brake priced around $120 installed, with cruise control.

Taxi-fleet owners are interested. Experimental cabs are using the brake in San Francisco, Oakland, Buffalo, Detroit and New York. Two big dairy chains and an oil company have been dickering for truck try-out installations. END

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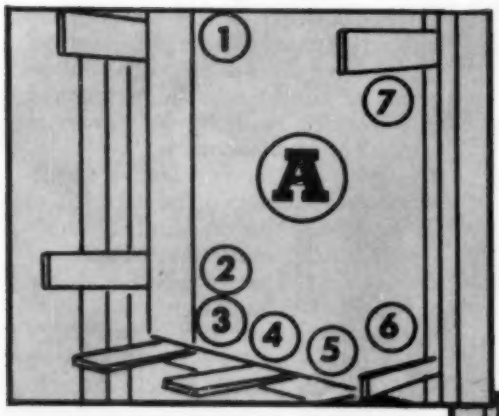

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How Near Is Space Travel?

[*Continued from page 131*]

face hazards, not only from possible collision with big ones, but from the erosive high-speed impact of dustlike micrometeors, flying through space at up to 40 miles a second. A satellite observatory, detecting these micrometeors by condenser microphones or by the pitting of polished plates, can provide more firm data about them.

How about radiation? Cosmic rays, streaming down from space, will intensely bombard a spaceship that emerges from the protective cover of the earth's atmosphere. They consist mostly of protons and alpha particles, the lightweight cores of hydrogen and helium atoms.

Quite recently, however, extreme-high-altitude rocket observations have led to discovery of a more alarming kind—"heavy-particle" cosmic rays of iron and calcium nuclei. These compare with the lightweight particles as cannonballs do to bullets. An alpha particle can pass through a living cell without serious damage; an iron or calcium particle wrecks the cell.

What these blockbusters may do to the body is conjecture — no one has ever been exposed to them. Space-medicine experts foresee that they may perforate the body with such wounds as sterilized needles would leave—and cause flashes of light as they strike the eye's retina, perhaps with permanent damage to vision.

An artificial satellite will tell more about these strange rays, which radiation instruments can register directly; and tests of their effects on experimental animals may be possible. Space-flight planners will await the results anxiously. For if the rays are gravely dangerous, spaceships must protect passengers from them with massive shielding, whose weight will be a serious handicap in a take-off.

How soon we have space travel will depend on the answers that earth satellites supply to questions like these, among many others. Long urged by space-flight proponents, the satellite project now to be realized will pioneer the way into the virtually unexplored region beyond the earth. **END**

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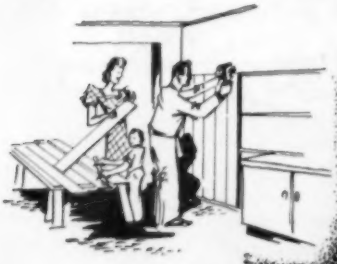

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Brain Waves Explain Family Fights

[Continued from page 151]

four, has 14 to 30 cycles per second, with pronounced alternations of strong and weak rhythms. It is associated with anxiety and tension, whether acute or chronic.

The Delta waves are very slow in comparison with the others, ranging from 0.5 to 3.5 per second. People in whom the Delta wave occurs prominently are docile and suggestible, being easily led: a good many criminals are found to have pronounced Delta waves, but they are almost invariably followers and not leaders in the criminal group. The Delta wave is also associated with disease. If any region of the brain is distorted by an injury, or invaded by an abnormal growth, it sends out a Delta signal, which can serve as a mute SOS.

Studies of the brain waves of persistent criminals have produced some interesting results. Dr. Daniel Silverman of Philadelphia tested a large number of psychopathic criminals in state hospitals and found abnormal brain rhythms in more than half; other students have discovered such abnormal rhythms in as many as 75 or 80 percent.

Dr. Elizabeth Jones of the University of Michigan Medical School examined the brain records of a large number of juvenile delinquents and found that 70 to 80 percent had abnormal patterns. In some cases, this abnormal pattern was similar to that found in certain forms of epilepsy—although, of course, the great majority of epileptics have no criminal tendencies whatever. There are a number of drugs that help epileptics, and experiments are now in progress to see whether the same drugs may prove useful in the case of a juvenile delinquent who has the same type of abnormal brain wave.

Do the brain waves bring on various mental states? Or are they the result of such states? Probably both are true. Most people are familiar with the operation called lobotomy, which is performed on mental patients who are tremendously

[Continued on page 300]

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*T. M. Reg. Easi-Bild Pattern Company

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KLEAN-STRIP

Paint Remover

THE KLEAN-STRIP CO., INC.
2340 S. Lauderdale, Memphis 6, Tenn.

Brain Waves Explain Family Fights

[*Continued from page 298*]

disturbed, suffering deep anxiety and excitement. In this operation, the surgeon cuts the nerves that carry the electrical impulses from the front part of the brain to the rear. Although the operation is almost always successful for a time, the results have not been found to be invariably permanent.

The relation between the electrical rhythms of the brain and the sort of mental disorder that often results in criminality is shown strikingly by two other facts. The first is that electric-shock therapy is sometimes of great value with those who are mentally ill. This consists of putting an electric charge through the brain; it is as though the normal electrical processes were being hampered by dirty terminals or weak connections, and the sudden strong charge restored them. The second is that when an electric current is transmitted deep inside the brain, the patient is sometimes greatly improved—so much that some experts in this field are hoping that this technique will some day replace lobotomy.

Many authorities believe we shall some day be able to prevent both the troubles of incompatibility and a large proportion of all criminal behavior through our better understanding of the electrical rhythms of the brain. But this is still far in the future. In part, if it comes, it will result from general recognition that a person who can't get along with others, and who demonstrates this in varying degrees, is often suffering from a physical illness that might have been prevented, and perhaps can be alleviated or cured.

One of the leading experts in this field is Professor W. Grey Walter of the Burden Neurological Institute, Bristol, England, and much information is to be found in his book, *The Living Brain.**

Professor Walter has even made the suggestion that perhaps international conferences would go much better if we

[***Continued on page 302***]

**Published by W. W. Norton, 101 Fifth Ave., NYC.*

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See your lumber dealer first when building. He can be a one-stop, complete solution to your building problems. The average lumber dealer can offer you practical help with plan, lot, loan, material and construction.

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Brain Waves Explain Family Fights

[Continued from page 300]

could only find out what sort of brain waves various diplomats possess, and then try not to put conflicting personalities up against each other.

In the case of George and Helen, the marriage counselor pointed out that differing brain waves made it difficult for them to make decisions together.

He said, "You, George, have very powerful visual images. When any problem comes up, it can be translated into mental pictures, you see the answer clearly and at once, and are impatient with anyone who cannot do likewise.

"You, Helen, are just the opposite. You have hardly any visual images at all. But problems that cannot be presented as pictures, and which bother George greatly, present little difficulty to you."

The young couple was silent for a minute. Then George said, "I guess we never should have gotten married."

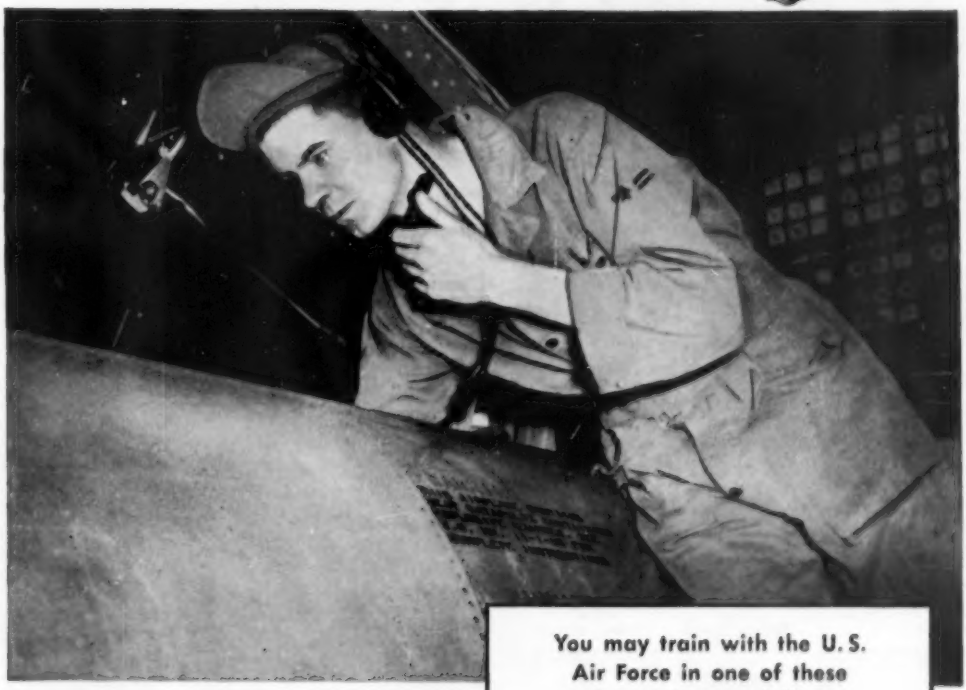
"Nonsense!" said the marriage counselor. "There's no reason in the world why you shouldn't be perfectly happy together. When one of you starts to get irritated, just say, 'Brain waves!'" END

Hydrogen Easily Kept Liquefied After Novel Separating Process

LIQUEFIED hydrogen at colder than 400-degrees-below-zero temperature can now be stored in unrefrigerated containers, for industrial and national-defense use. A National Bureau of Standards process for separating large quantities of 97-percent-pure para-hydrogen makes the feat possible.

This may be the first practical application of the fact that ordinary hydrogen is a mixture of two kinds of molecules: one-fourth are para-hydrogen, whose nuclei spin in opposite directions, and three-fourths are ortho-hydrogen with nuclei spinning the same way. At low temperatures, ortho-hydrogen gradually and spontaneously turns into para-hydrogen. In doing so, it gives up heat. Consequently liquefied para-hydrogen has much better storage qualities than ortho-hydrogen or the normal mixture.

Put your electronic skills to work



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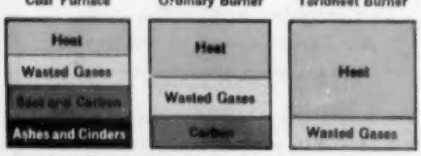

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Affiliated Canadian Manufacturer: Aero Tool Works Limited, Toronto, Ont.

Our Flying Emergency Squad

[*Continued from page 141*]

TAC. This is a method of aerial refueling that enables three birds to drink at one time. The fighters come up behind a tanker and stick their noses into funnel-tipped trailing fuel hoses. Using the boom system, a tanker can handle only one plane at a time.

If the real thing came, however, a tactical strike force would not be dependent solely on its own tankers. TAC would request the Strategic Air Command, with its far-flung global bases, to send up tankers at prearranged refueling rendezvous.

In refueling, under normal conditions, the boom operators in the tail of the tanker radio-talk the fighters into position. During radio silence, however, this can be directed by hand signals or, at night, by a system of colored lights.

Photo-reconnaissance. Close on the jet-spouting tails of the Thunderstreaks would be their photo-reconnaissance companions—the RF-84 Thunderflashes, armed principally with cameras but also spouting .50-caliber machine guns to fight their way into picture-penetration over enemy territory.

On their own would be the Blackbirds, or Cranberries. These are the B-57 jet light bombers, a U.S. version of the British Canberra. A night intruder, neither the B-57 nor the RB-57 photo version is equipped for in-flight refueling. They would depend on their longer range to land and take their drinks on the ground at air bases en route.

TAC has growing pains. It terms the B-57 an "interim" weapon for the job—a transition trainer for the tactical bomber of its dreams—the Douglas B-66. The B-66, now undergoing its final flight-test phase, is earmarked for the tactical strike forces. It is supersonic. It is capable of probe and drogue in-flight refueling. It is, as Gen. Weyland puts it, "a more sophisticated weapons system."

By that he means that the B-66, day or night, good weather or bad weather, can beeline to its target and pinpoint its

[*Continued on page 332*]

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Homasote is the oldest and strongest insulating-building board on the market. Type RD is $^{21}/_{32}$" thick, ideal for this purpose. The material saws and nails easier than wood, takes any paint or stain, lasts for years.

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*T.M. Reg. Easi-Bild Pattern Company

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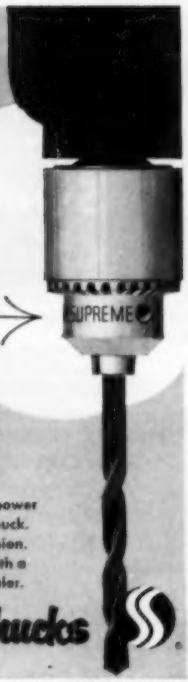

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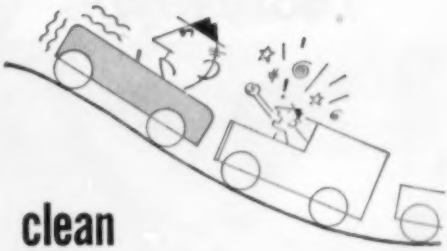

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Every slight grade seem like you're climbing Pike's Peak? A dirty, gummed-up carburetor may be holding you back. Stands to reason. Your carburetor is built to deliver peak performance *when it's new.* But when gum deposits build up and clog tiny gas and air passages, the delicate fuel-air ratio is upset. Only cure: *clean it!*

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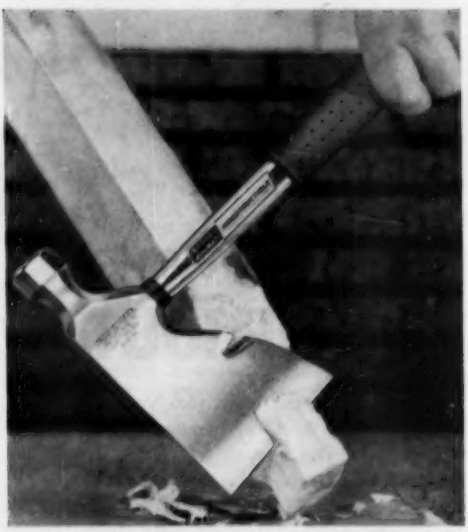
Tool News



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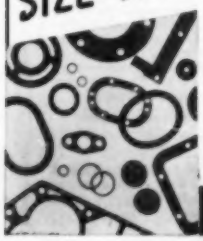

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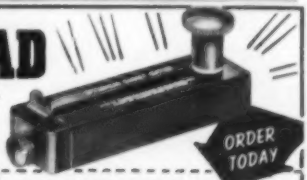

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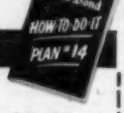

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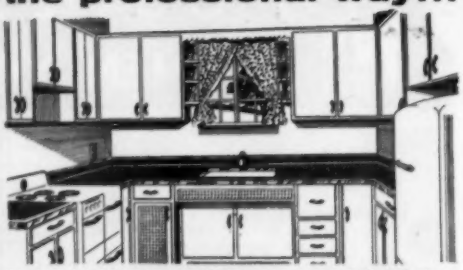

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Perfect bevel and angle maintained, and foolproof depth control for all Rip, Cross-cut, and Handsaws. Precision made and calibrated for instant setting at desired angle. Can be used in any vise or clamp. Complete with file, only.. **$6.50 ppd.**

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Guaranteed

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Sensational new Super Filer No. 11 joints and sharpens both **hand** and **circular** saws 6" to 10" with all teeth the correct height, depth, pitch and bevel. Easy to use—when file hits hardened steel roller, teeth are finished. Saw runs true and smooth with no side pull. Complete with special 8" file **$9.95 ppd.** "**TRU-CIRCLE**" saw set automatically sets teeth at 10° or more **$2.95.**

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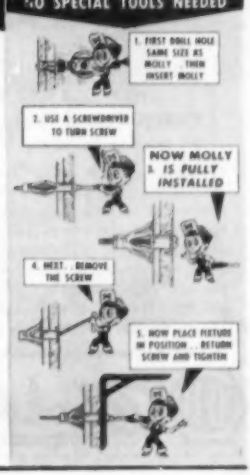

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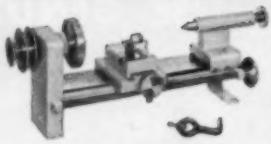

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Silent, high efficiency, Helical Gear Type Ball Bearing, Hydraulic Pump or Motor. Rated 8 Gal. Per Min. At 1500 R.P.M.—delivers 1000 P.S.I. Using 6 H.P.—Reversible Rotation—3/4" Pipe Thread Inlet and Outlet Ports—1/4" Drain Port—3/4" shaft with keyway and flat for either direct or pulley drive. Dimension—5 3/8" high, 7½" long, 5½" wide. Shipping weight 18 lbs. F.O.B. Chicago **45.50**

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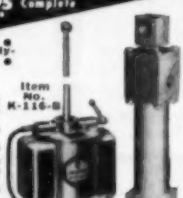

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ALL OF ABOVE INCLUDED F.O.B. Chicago

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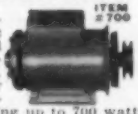

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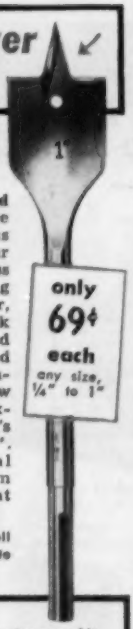

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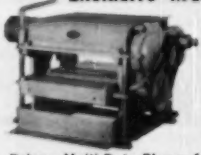

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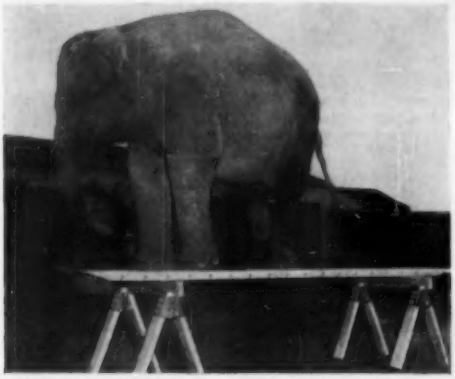

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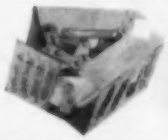

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Model PG-12 sharpens, joints, gums, and retooths all cross cut, rip, combination, miter, and planer blades up to 12" in diameter. Two precision index plates give versatile, accurate sharpening. Guarantees precise spacing of teeth. New safety rest prevents tilting and gouging of blade. Save time and money. Special $3.00 grinding wheel also included for use on your own power table. Fits regular or radial swing tables.

Order today. Send check, cash, or money order. We pay postage.

QUICK-WAY SAW CO.
100 Hornby Drive, Painted Post, N. Y.

GIGANTIC SAVE-TO-70% MAIL SALE WAR SURPLUS EXCESS INVENTORY BANKRUPT STOCK

A-C TRANSFORMER

*Finest new Govt. transformer, step 115-v up to 230-v or 230-v down to 115-v, 60-c.
*Rated at 3,000-w. Many uses home and business. Govt. Cost $50.00. **SALE, PREPAID, $29.35**

ARMY POWER PLANTS

*Marvelous buys in new condition Govt. surplus plants and generators. We pay freight!

*1000-w, 115-v, 60-c, **$149.50**
*2000-w, 115-v, 60-c, **$289.50**
*3000-w, 115-v, 60-c, **$349.50**
*7500-w, 115-v, 60-c, **$590.00**
*3000-w, DC generator **$58.75**

Send for free bulletin

AIR COMPRESSORS—TANKS, Etc.

Save to 70% on air fittings, tanks, compressors, etc. See our catalog.

*Piston Air Compressor, 150 lb.	$18.91
*Air Corp 300-lb. Pressure Tank	6.79
*Auto Pressure Switch for Motor	4.95
*Professional Paint Spray Gun	9.95
*DeLuxe Air Kit complete	45.49

SPECIAL LISTINGS

*We list below some really super prepaid-to-you bargains available in limited quantities. Order promptly to avoid losing out on these fine buys.

*$3,000 Giant Searchlight (FOB)	$159.50
*30" Window Fan Kit	15.95
*$380 Adv. Air Corp Light Set	19.81
*$68 Centrifugal 1½" Pump	24.61
*$98 Centrifugal 2½" Pump	44.37
*$150 Experimental Amplifier	6.97
*$135 AC-DC Power Rectifier	19.61
*115-v AC Electric Chain Saw	89.25
*$175 5-row Weed Spray Outfit	97.65
*Genuine Eastman Film and Paper 70% discount	
*987 Hydraulic Cylinders	3.89
*Also Hydraulic Pumps, Valves, etc. Save 60%	
*Navy Steel Letter Dies	6.91

ARMY SLEEPING BAG

*Finest wool O.D. color, very warm. Zipper closer. Fraction original cost Only $4.29 Prepaid
*Water proof cover $1.46 Extra

SPECIAL OF THE MONTH!

GIANT FRESNEL FLOODLIGHT
over 2,000,000 candlepower!!!

*Marvelous light for advertisers, contractors, parking lots, merchants, night clubs, etc.
*Consists of immense "light house" type multi-element optical lens that focuses and multiplies light into wide high intensity beam.
*Complete with colored clamp on filter (for special color effect) also two 115-v, 1000-w, mazda bulbs.
*Lamp has bi-speed powerful 115-v, 60-c, motor fan in base for cooling high intensity bulbs. New and perfect.

Govt. Cost $860.00 SALE, PREPAID **$44.50**

SPECIAL FROM PREVIOUS ADS

*G-v. Hydraulic Pumps 2500 Lbs.	$45.40
*Precision Surveyors Tripod Level	37.95
*Automatic Remote Control Switch	13.85
*Army Tool and Parts Cabinet	7.99
*Selsyn Motors, 110-v, 60-c Pair	12.97
*Electrical Experimental Kit	4.99

We pay transportation except where Felt. Write for large FREE catalog, 1000 items.

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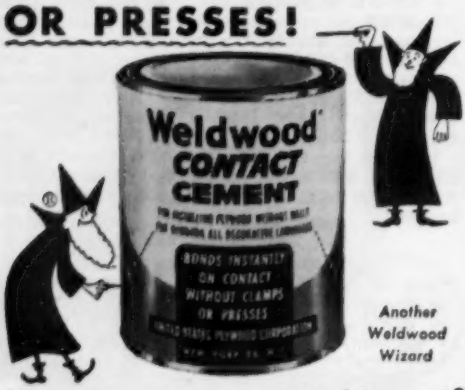
DO-IT-YOURSELF

NOW! APPLY MICARTA

or other Plastic Surfacing

WITHOUT CLAMPS OR PRESSES!



Another Weldwood Wizard

Use amazing new Weldwood® Contact Cement! Bonds instantly... permanently on contact! Makes it easy to modernize table tops, kitchen counters, bathroom surfaces!

Weldwood Contact Cement works like magic! No need for clamps or presses. Just apply . . . let dry . . . then bring laminate and surface together! Instantly you get a permanent bond!

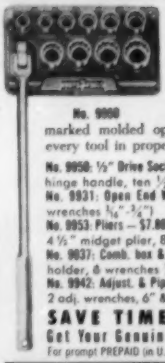
PUT UP PLYWOOD WITHOUT NAILS! Do it yourself with Weldwood Contact Cement. Revolutionary new method —faster, easier. No nail holes to spoil finished surfaces!

1001 JOBS MADE EASIER around home, shop, garage. Weldwood Contact Cement bonds any combination of wood, glass, leather, paper, cloth, Fiberglas® and metal (including do-it-yourself aluminum).

In tubes, bottles, cans. 25¢, 35¢, 60¢ and larger sizes at hardware, paint and lumber dealers and variety stores. Mail coupon for leaflet!

United States Plywood Corporation
Dept. 116, 55 W. 44th St., N. Y. 36
Please send me information on Weldwood Contact Cement.
Name_____
Address_____
City_____ Zone____ State_____

PROTO Low-Cost ADDA-UNIT **TOOLS**



No. 9000

No. 9931

No. 9953

No. 9937

No. 9942

Start your Master Set of genuine PROTO Professional-Quality tools NOW. Add units as budget permits. Each set with handiest tool-holder ever made. Super-tough plastic, with marked molded openings for each size, keeps every tool in proper place.

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No. 9931: Open End Wrenches $6.14 (Incl. holder, 5 wrenches 5/16"-7/8")
No. 9953: Pliers — $7.80 (Incl. holder, 6" thin nose plier, 4½" midget plier, 8" multi-plier, 9½" utility plier)
No. 9937: Comb. box & open End Wrenches — $9.40 (Incl. holder, 8 wrenches ¼"-9/16")
No. 9942: Adjust. & Pipe Wrenches — $9.64 (Incl. holder, 2 adj. wrenches, 6" & 10", 2 pipe wrenches 8" & 14")

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GENUINE ALNICO—NEVER WEAKENS

AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC
Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweepings. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. GUARANTEED. Try any magnet one week. Money refunded if you are not well pleased.

No. S-725 (Weighs 54 oz.) Has pull of 225 lbs. on steel block $15.00
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No. S-575 (Weighs 18 oz.) Has pull of 75 lbs. on steel block $ 6.00
No. S-500 (Weighs 13 oz.) Has pull of 50 lbs. on steel block $ 4.00
No. S-101 U-shaped Magnet (Wt. 2¼ oz.) Pull of 6½ lbs. 2 for $ 1.50
No. S-291 Pocket Magnet (Wt. 1½ oz.) Pull of 4 lbs. 2 for 1.15
No. S- 35 Hobbyist assortment of eight small magnets. . . . . $ 1.50
No. S- 48 Powerful Hot Pad Magnets, 8 for $1.00. . 30 for $ 3.00

Send Money Order or check. We pay postage. No C.O.D.'s.
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ADJUSTABLE PIPE JAWS hand finished. Converts any bench vise to a pipe vise. Position either vertical or horizontal. Guaranteed.
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Solders metals instantly ...just apply Swif and heat

Swif is real 50/50 Tin-Lead solder with flux in paste form that makes all kinds of soldered connections permanently—and fast. No separate flux needed. Just apply Swif by squeezing the unbreakable plastic tube and heat with torch or iron—on small jobs even a match will do the job perfectly. Each tube holds enough solder for hundreds of jobs. Swif has been used by professional plumbers for years. At hardware stores, hobby shops, plumbing dealers, auto stores. 59¢.

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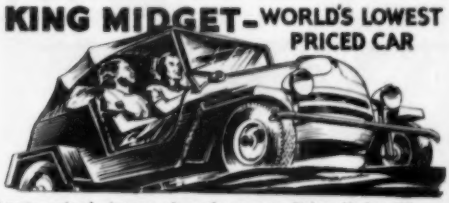

Lower priced, improved performance. Drive it for 75c per week. Also KING MIDGET JUNIOR, finely engineered, less than one-third cost of any comparable car, one twelfth cost of large cars. Agents wanted. IT WILL PAY YOU TO GET THE FACTS. Send 25c for literature and agents proposition on both cars, or $1 (refunded first order) for this plus actual assembly book and service manual.

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ONLY $2.45 each
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Beaver's new improved high speed side cutting drill bit can be used on any electric drill, drill press, lathe or milling machine. Made from the finest American high speed steel. 3½" long. 2" side cutting section. ¼" diameter. Designed to cut steel, wood, plastic, aluminum, etc. A versatile time-saving tool for EVERYONE. Money back guarantee! Three types available: All-Purpose, Wood and Heavy Metal—specify type desired. Buy them from your dealer today! Or send cash, check or money order NOW.

SET OF 3 MAKES AN IDEAL GIFT.
Dealer inquiries invited.

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SAVE on air conditioning

with RED TOP* Insulating Wool

It pays for itself. You can save on air conditioning costs two big ways by insulating walls and ceiling with RED TOP WOOL:

1. A smaller, less expensive central or room air conditioning unit will do the job (saving you *hundreds* of dollars, in the case of a central unit).

2. Operating costs drop sharply (cutting them in half is not unusual).

Add to this the saving in winter heating costs, and RED TOP becomes a long-term investment that soon pays for itself.

Fireproof RED TOP mineral wool is tops in heat-stopping, heat-saving ability. Preformed batts and blankets for installing between open studs, joists or rafters. Nodulated for pouring or pneumatic blowing. For details, write Dept. PS-5, 300 W. Adams St., Chicago 6. *T.M. Reg. U.S. Pat. Off.

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the greatest name in building

Hastings Oil Filter Cartridges keep oil clean from filter change to filter change* when replaced as normally recommended... The reason is DENSITE

Densite—an amazing new type of filtering material—is made of millions of selected raw cotton fibres, pressure packed so oil must flow through countless tiny openings, pass many surfaces of fibres. The most microscopic abrasives cling to these fibres—and stay there!

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* As proven by tests conducted in accordance with U. S. Bureau of Standards procedure.

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HASTINGS, MICHIGAN

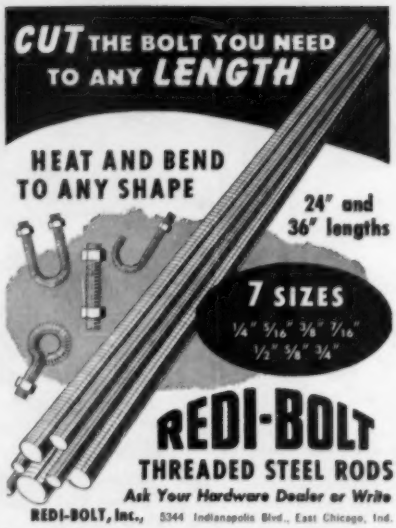
HASTINGS
OIL FILTER CARTRIDGES with DENSITE

CUT THE BOLT YOU NEED TO ANY LENGTH

HEAT AND BEND TO ANY SHAPE

24" and 36" lengths

7 SIZES
1/4" 5/16" 3/8" 7/16" 1/2" 5/8" 3/4"



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"Amazing New Mason's Tool"
Makes it easy for amateurs to build masonry block walls. Lays smooth ribbon of mortar. Saves time and money. No waste of mortar. Send for FREE Folder.
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1,001 USES—HOUSE, GARDEN, FARM
Original All-Purpose Pump has 3,000 GPH capacity, 450 GPH 50' high; or 1800 GPH from 25' well. Use any 1/6 to 3/4 HP motor. Stainless steel shaft. Oil-less bearing. 1" inlet; 3/4" outlet. Motor coupling included.

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BEST SMALL MIXER MADE.
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use REX for a perfect job!

Use the paste professionals prefer—for a beautiful wallpaper job every time. Rex works easily, saves time and labor—sticks to stay. Complete, simple instructions on every bag!

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For BEST RESULTS you can always depend on Wilhold Glue. Clean to use! Damp-proof! Invisible when dry! In plastic applicators, tubes, jars.

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200 amp. aircooled "Husky Boy" gasoline engine driven welder

Earn hundreds of extra dollars. Set up your own full or part time welding shop. Cash in on the big demand for emergency repair work . . . a Hobart quickly pays for itself out of extra profits.

"HUSKY BOY" welds anywhere! In or out of the shop the "Husky Boy" can earn big profits for you. Light weight makes it ideal for using on small service truck for emergency calls, or for use in the shop. Wheels and handle available at a slight additional cost.

200 AMP. ELECTRIC DRIVE (Bantam Champ) Specially built for smaller shops requiring lighter weight and low investment. Gives full 200 amp. capacity. Lets you do production and repair work right in your own shop.

AC POWER—AC WELDER. An excellent dual purpose combination. Welds or runs lights, tools, motors independent of power lines. Can be belted or coupled direct to your own gasoline engine.

CONTRACTOR SPECIAL for all types of construction and outside repair welding. This 250 amp. welder is perfect on jobs where speed and quality are a must. Has 1 KW DC auxiliary power for operating lights, tools, etc. Portable mountings are available.

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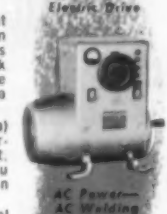

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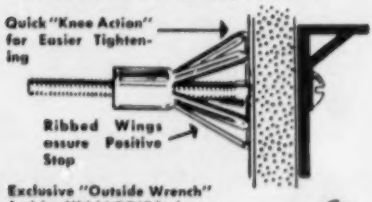
HOLLOW WALL SCREW ANCHORS

Securely fasten mirrors, pictures, cabinets, curtain and shelf brackets to plaster, wallboard, gypsum, cinder block, marble, hollow tile . . . with perfect ease and safety. Quick "Knee-Action" permits tightening with practically no effort. Ribbed wings assure a "Positive Stop" — tell you when WALLGRIP is set . . . guarantee a vise-like fastening everytime. Yet fixtures can be quickly removed and replaced when redecorating — without disturbing the WALLGRIP.

FREE PAMPHLET! "Don't be a WALLFOULER." Write Dept. PS-9



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NOW REDUCED TO only $8.95

First to fit ¼" drills, this rugged portable jig-saw attachment has same capacity & precision as $55 saws. Does work of **jig, keyhole, coping, crosscut, rip, band & hacksaw**! Built-in "Air-Jet" blows away sawdust. Guaranteed to cut intricate patterns—however large—in plywood, plastics, metals—even cuts **2x4's**! Starts inside holes. Includes blade. Converts to **Table Model** with "ARCO STAND" Sturdy Casting....$2.75 6 Extra Blades....$1.95

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The "Little Marvel" all-metal welder. 5-year written guarantee. Welds ⅛" metal or money back. Repairs tanks, tools, fenders, machine parts, etc. Complete with everything—rods, unit, eye shield, directions. $6.45 plus 50c postage. Flame torch accessory for soldering, cutting, brazing $3.95 complete with carbons, brass rods, flux. $2.00 deposit on C.O.D. ¼ inch Transformer Welder $19.95 F.O.B.

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Describes attic finishing, built-in cabinets, add-a-room, recreation room, kitchen remodeling, summer cottage and farm projects. Contains helpful information on how to get started, planning, cost estimating, materials purchasing, and proper procedures, also nail charts, moulding designs, etc. Send only 25c and also receive FREE 52-PAGE POWER TOOL CATALOG.

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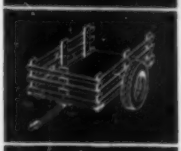
TEENUTS

steel threads in wood



TEENUTS mount flush without counter-boring. Excellent for new work or repairs . . . wood to wood, wood to metal . . . and where old screw holes have worn out. Simply drill hole for TEENUT barrel, hammer home TEENUT and its steel prongs provide rigid, permanent anchorage. Same size hole for bolt. Sizes to fit standard bolts: 6-32, 8-32, 10-24, 10-32 (4 per card), ¼-20 (3 per card), 5/16-18, ⅜-16 (2 per card).

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Wonder-Paste makes paint, varnish, enamel, etc. come off easily—not coat by coat, but all in one scraping. Easily applied with a paint brush. Won't run on upright surfaces. Ideal for furniture, cabinets, trim, floors, etc.

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Over 5 million cans sold—it must be good.

Write for leaflet and advice on removing.

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Building materials dealer says:

"Don't just INSULATE—TWINSULATE!"

"New aluminum TWINSULATION gives you double action!"

says Guy Mosteller, Rochelle, Ill., building materials dealer shown above installing Gold Bond TWINSULATION® in his own attic. "TWINSULATION is a double barrier against heat. The fireproof rock wool *blocks* heat, and the aluminum surfaces *reflect* heat. Blankets are rugged and easy to install because the rock wool center is sealed to both sides of aluminum covering."

TWINSULATE *your* attic this weekend! Next winter, your heat bills will be up to 25% lower. In summer, your house will be up to 15° cooler. See your Gold Bond building supply dealer—or send coupon below for fact-filled "Home Insulation" booklet.

NATIONAL GYPSUM CO.
BUFFALO 2, N. Y.

NATIONAL GYPSUM COMPANY
Dept. PS-95, Buffalo 2, N. Y.

I enclose 5c for "Home Insulation" booklet.

Name.....

Address.....

City.....*Zone*.....*County*.....*State*.....

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FOR HOBBYISTS WITH

DU PONT DUCO CEMENT

REG. U.S. PAT. OFF.

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Put tool handles back on to stay—tough, durable "Duco" Cement will hold.

Attach sandpaper to sanding disc face with tight-gripping "Duco" Cement.

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Build model airplanes neatly with transparent "Duco" Cement. It's almost invisible and *extra-strong*.

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Mount arrowheads to file cards with flexible, tight-gripping "Duco" Cement—permits easy cataloging.

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Hold radio coil windings tight with "Duco" Cement—it won't absorb moisture.

To make working-model boats really strong and seaworthy, fasten them together with waterproof "Duco" Cement.

NEW CAP HAS HANDY APPLICATOR TIP

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BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

GRAVELY makes Leaves VANISH!

Rotary Mower and Leaf Mulcher

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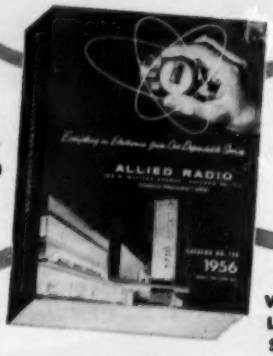

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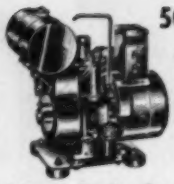

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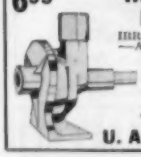

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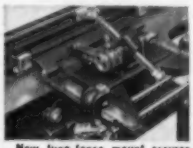

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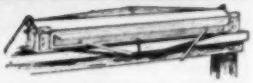

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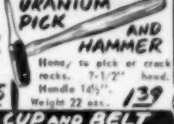

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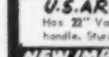

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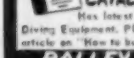

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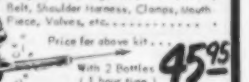

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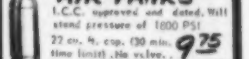

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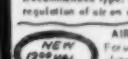

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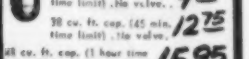
Made of gum rubber with a sturdy glass lens and adjustable head strap. A Bargain!

SMALL 99¢ MED. 1.49 LARGE 1.89



NEW FROGMAN SUITS

Of finest quality seamless Latex rubber. Two piece type. Factory seconds with minor imperfections, but guaranteed. With either long or short arms and legs. Please specify. $54.95 val. 24.95

AIR CORPS RUBBER BOATS

Ideal for Fishing and Hunting. Made to top Gov't Specs. Reconditioned & ready to use. Order Today!

1 MAN 22.50 7 MAN 69.50 10 MAN 115.00

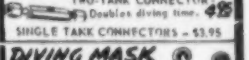
HAND AIR PUMP . . . 3.95 COLLAPSIBLE OARS 1.25 EA.

NYLON ROPE

Finest Quality. Lustrous white. Has tremendous tensile strength.

SIZE	Strength	PRICE
1/4" Orlon	1100 lbs.	8¢ run. ft.
3/8" Nylon	2700 lbs.	13¢ run. ft.
1/2" Nylon	5000 lbs.	27¢ run. ft.
1" Nylon	18,000 lbs.	50¢ run. ft.

¼" sea green, braided Nylon, 1000 lbs. breaking strength. . . . 6¢ run. ft.



ARMY LENSATIC COMPASS 3.95

For hunter, camper, hiker, surveyor, Boy Scout, etc. Use for map orientation, azimuth reading or as a guide on unfamiliar terrain. Has 360° rotating bezel ring marked in 3° notches. "Peep" sight for sighting objects.

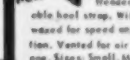
5.95 VAL.

NEW NAVY CHEST WADER

Made to top Gov't specs of finest quality rubber with warm felt inner lining. Comes up to your chest. Has built-in boots, shoulder straps and vulcanized seams. Sizes: Med., Lrg. NEW! $25.00 value . . . 7.95

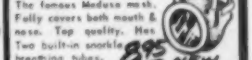
NEW NAVY WADING BOOTS

A Surplus Bargain. Made of top quality, rubberized NYLON – vulcanized to Latex rubber shoe. Shoe is insulated against cold and has grip-teed sole. Boot is thigh height. Order one size larger than shoes. Sizes: 8, 9, 10. 3.49



NAVY WADING SUIT

Makes Surf or Deep Stream Fishing a pleasure. Also ideal for use when it is necessary to protect the body or clothes from mud, moisture, etc. Made to top Gov't specifications. Originally made for use in landing operations. Of heavy duty rubberized canvas with vulcanized seams. Built-in rubber boots & gloves. Sizes Med. & Lg. A $25.00 VALUE 9.95 NEW



ARMY STEELFRAME RUCKSACK

Army Ski-Trooper Rucksack made of heavy duty duck. Has one large and 3 small compartments. Adjustable straps and bindings. Mounted on lightweight, comfortable, all-steel tubular frame. Ideal for hunter, hiker, boy scout, prospector, etc. . . 8.95

ORDER FROM THIS AD. Pay by Money Order or Check. 1/2 deposit with C.O.D.s. P.O.s accepted from D&B firms. All prices F.O.B. Los Angeles.

PALLEY SUPPLY CO 3263 S. VERNON AVE., DEPT. PS-9 LOS ANGELES 58, CALIF.

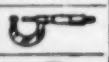
WAR SURPLUS AND OTHER BARGAINS SAVE UP TO 90%

P1 GENERATORS
Electric Auto-Lite. 200 Amps. 24 Volt. 4400 RPM. Dandy arc welder. Wt. 53 lbs. Approx. GOVT cost $450. Like NEW. $12.50 incl. easy diagram.

NEW IMPROVED MODEL MAUSER-TYPE PRECISION 1/1000" VERNIER CALIPERS
Quick, handy, accurate. 6" Vernier Calipers. Glass hardened, lapped measuring surfaces. Fine engraved scales—1/1000" & 1/10 mm for inside, outside & depth measurements. Friction thumb release. Larger capacity. 2 gib adjustments. Reg. $25. Now only $7.50 with Leather case

MICROMETER DEPTH GAUGE
With 3 rods to measure all depths from 0 to 3 inches by thousandths. Hardened tool steel lead screw has full 1 inch run. Base is 2½" long, hardened ground and hand lapped. Accuracy guaranteed. Mfd. by Millers Falls Co. GOV'T COST approx. $30. NEW—$10.95 ppd. USA. In velvet case.

MICROMETERS Chrome plated, precision engineered, carefully tooled to give long life. All new 0-1" cap. $2.25 ea., 1-2" cap. $3.50.



SENSITIVE ALTIMETER in 10 Ft. Increments. Famous Pioneer! 0 to 35,000 ft. (inches of Mercury). Tested and inspected in our own instrument lab. Guaranteed perfect. Approx. Govt. Cost $150. NOW ONLY $13.95 Ppd U.S.A.

NEW PUMP AND MOTOR
Pump has 1" connections, built-in relief valve, adjustable up to 1500 lbs. Max capacity 6 GPM. 1½ H.P., 24-volt motor. 4000 RPM. Can be used on 12 or 36 volts. Govt. cost approx. $350 — our price — NEW — $9.95.

NEW 1955 CATALOG Biggest ever . . . new low prices . . . Send 25c for your copy today. Prices F.O.B. Culver City unless otherwise stated. Check, money order or cash, 25% deposit for C.O.D.

AIRBORNE SALES CO., INC. DEPT. PS955
8501 Stellar Drive, Culver City, Calif.

New Automatic Clutch modernizes power equipment

- Power Mowers
- Garden Tractors
- Midget Autos

Install new Mercury clutch yourself on any gasoline driven equipment up to 3½ H.P. Engines start easier with exclusive VelveTorque automatic transmission. No troublesome controls. Load engages smoothly as you accelerate engine. No stalling. Engines do bigger jobs on less gas. Quickly installed with *one screw*. Available in ½", ⅝", ¾" bore sizes, with standard 3" x AB pulley assembly.

ONLY **$7.95**

MERCURY CLUTCH DIVISION
1204 Camden Ave., S.W., Canton 6, Ohio
Enclosed is $7.95 ☐ Check ☐ Money Order
For Mercury Automatic Clutch
Shaft size ☐ ½" ☐ ⅝" ☐ ¾"
Name_____
Address_____
City_____ State_____

[*Continued from page 304*]

bomb drop *without* any assist from devices or signals on the ground. And the RB version has electric reconnaissance equipment that will shove present aerial camera equipment back into the Brownie box-camera class.

Even from an advanced base, an enemy target might be beyond the range of tactical combat or reconnaissance planes. That's no sweat for these strike units. In-flight refueling again, but with a twist. Over shooting territory, a big, slow, propellered tanker would be a sitting duck. To take care of that, TAC has developed the buddy refueling system.

If a mission called for the delivery of two atomic "bugs" on a target, four Thunderstreaks and one propellered tanker would "leap off" the airstrip. Two of the F-84s would carry the bomb; the other two would be equipped with external refueling tanks. At a safe distance the conventional tanker would transfer fuel to the fighter-bombers-become-tankers. Then these two would fly as wingmen for the bomb toters, give the latter a drink when they became thirsty, and then fight their way back.

As a new weapon of the air, TAC's mobile strike forces are writing the rules as they go along. At Langley, Gen. Weyland has personal command of a pilot, or guinea-pig unit—the 405th Fighter-Bomber Wing, equipped with Thunderstreaks and B-57 jet light bombers.

It is ready to go. One squadron has 16 Thunderstreaks, their pilots and ground crews, on stand-by alert at all times. The refueling tankers are there. Spare parts, consisting of some 2,500 items, from less-than-an-ounce cotter pins to 4,500-pound jet engines, are packed in 150 flyaway kits. For every communications center, search-radar unit and command-control headquarters, there is a spare stowed in trucks ready to be loaded on C-124 Globemasters.

In training for reality, squadrons are alerted regularly. The pilots and ground crews are given less than an hour to

[*Continued on page 334*]

Get the oil filter element with the

ACCORDION FOLD

Genuine Ford Oil Filters are designed with an extra large filtering area to cut engine wear by 60%

When it's time for a replacement in *your* Ford (about every 4000 miles) insist on a *Genuine Ford* Oil Filter Element. It's made to the exact specifications set up by the men who originally built your Ford —so you can be sure you're getting all the protection your Ford's engine is entitled to. What's more you also know that the element you're buying has passed all of Ford's own special endurance tests before it was authorized for production.

Oil filters, spark plugs, fan belts, mufflers . . . remember *always* to specify Genuine Ford Parts. They're made right to fit right to last longer in your Ford!

GENUINE Ford PARTS

Keep your Ford all Ford

[Continued from page 332]

pack a small bag with a change of clothes and to say good-by to their families or friends. Then they are quarantined on the base until "leap-off" time. Family-pay allotments already have been signed.

The pilot, of course, is the really coddled one. He must be in top physical condition, free from worries or anxiety. In an F-84F, for instance, he may have to sit for more than 10 hours squeezed into a baby-chair-size seat—on oxygen most of the time.

He reports to the base hospital, where he is given a physical check and treated for any minor ailment, such as a mild cold. Then he is fed—but good. Steak—all he can eat. Next comes bed, for a normal night's sleep, with a sedative if the flight surgeon feels that he needs it. After the sleep, more steak, another physical check, and perhaps a drug to keep him alert and awake for 5,000 or more miles in the air.

Even at the end of his flight he can't be drowsy, for there might not be time to hit the sack before he went into action, replacing his dry external fuel tanks with bombs, rockets or atomic weapons.

Which of these weapons he'd use would depend on the situation. Gen. Weyland stresses the fact that with the tactical strike forces, flexibility rivals mobility in importance. Although all his combat planes have "atomic capability," they also can carry the full gamut of air weapons—conventional bombs, napalm fire bombs, rockets.

To illustrate the need for this versatility, he cites the Korean war. During the first, or North Korean part, he points out, we won with conventional weapons; the nuclear punch would have been wasted. Then came the Chinese Red aftermath. That, he believes, could have been nipped in the bud if we had used atomic attack against massed enemy troops, supply lines and airfields.

Gen. Weyland's favored use of his strong arm, however, is as a show of force to *prevent* war. While serving as commander of the Far East Air Forces not long ago, he sent the king of a small, friendly Southeast Asia country a unique birthday present—a flight of four F-84 fighter-bombers. He publicized the fact that they were able to refuel in flight and could have carried atomic weapons instead of birthday greetings. His not-so-subtle gesture was appreciated both by the friendly king and his people and by neighboring communists. END

COMING NEXT MONTH . . .

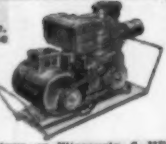
Color TV to Fit Your Pocketbook

COLOR television hits its stride this fall and POPULAR SCIENCE MONTHLY is ready with a full report for you. Here's the news you'll find detailed in October's special TV section:

- *New sets:* full-color photos of the color receivers you can buy this year—for the first time, a real variety.
- *Conversion kit:* a special report on a low-priced unit that puts color shows on your standard black-and-white receiver.
- *How it started:* a big full-color illustration that untangles the curious scientific background of the TV in your living room.

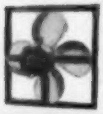
PORTABLE LIGHT PLANTS

GIANT 2000-2500 WATT PLANT



110-120 v. 60 cyc. AC absolutely the best made — exclusive dynamically balanced armature; heavy windings develop up to 5000 watt overload for motor starting. Skid mounted — portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine—complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty. (Item 31) Wt. 210 lb. Reg. price $585. Special at..... **$299.50**
Same plant with electric self starter (Item 31a)........ **$395.50**
Generator only and control box.... $169.50
DUAL VOLTAGE 110-220 available on any of above models for $28.00 additional.

CONDITIONAIRE VENTILATING FANS



Save big money installing your own exhaust fan. Efficient propeller type blade moves huge volume of air quietly and effortlessly. Heavy welded frame—predrilled for easy installation. Just cut opening and bolt in place. **Continuous duty** motors. Ideal for attics, restaurants, garages, barns, chicken houses, etc. Control manually or with thermostat.

Blade	Opening	CFM	Wt.	Item	
16"	18¼"	2925	19 lb.	365a	$27.95
18"	19½"	3600	27 lb.	365b	$31.95
20"	21¼"	4100	30 lb.	365c	$39.95

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM).

8" Pipe, wt. 5 lb.................. $6.85
9" Pipe, wt. 6 lb.................. $7.85
10" Pipe, wt. 7 lb.................. $8.85
12" Pipe, wt. 8 lb.................. $9.85

HEAVY DUTY FAN. Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E).................. $11.95
12" Fan, wt. 10 lbs. (Item 10D).... $12.95

MASTER DC ARC WELDERS

(Item 280)

Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to ¼" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. You can pay more, but you can't buy a better welder.

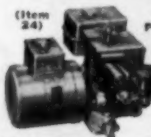
WELDER ONLY — DUAL CONTROL MODEL. Same as above, but drive with your tractor, jeep or gas engine of 13 HP or more. (Item 38a.) Wt. 110 lbs. $450 value.......... **$119.50**

WELDER ONLY—STANDARD MODEL. Same as above but with single rheostat for heavy metal welding only. (Item 38.) Wt. 110 lbs. $400 value. Special.. **$99.75**

COMPLETE POWER MASTER (Illustrated above) powered by a 14.6 hp., air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Compares with welder costing $1200. Factory Special.................. **$449.50**

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **$10.50**

TERRIFIC SAVINGS at MASTER MECHANIC's *bedrock factory prices!*



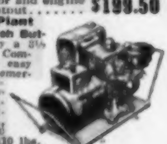
(Item 24)

600-700 WATTS PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. $275 value.... **$143.50**

1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output....... **$199.50**

1300-1500 Watt Plant



115v. 60 cyc. AC Push Button Start. Powered by a 3½ HP. Clinton engine. Combines big output with easy portability. Provides emergency power for operating any oil burner, sump pump, freezer, television, lights, communications systems, etc., which require up to 1500 watts. (Item 22) Wt. 110 lbs. Reg. $475 value, Factory price... **$239.50**

1750 Watt Plant Powered by 4.5 Briggs engine. Electric starting & battery charging built-in! Factory price **$279.50**

2500 WATT PLANT—Push Button Start (Item 21) 110/120 v. 60 cyc. A.C. A rugged powerful plant. Reg. $645. Spec. **$329.50**

3500 Watt Plant Push Button Start (Item 23) 115 v. 60 cyc. AC. Similar to above, but larger and 33% more capacity. Wt. 270 lbs. Reg. $760. Factory Price........ $379.50

Dual Voltage 110/220 available for above plants for $30.00 additional.

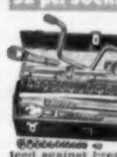
NEW! PERMA-CLEAR permanent bronze oil filter

10,000 miles

between oil changes

Never replace this filter, just give it a periodic rinse in gasoline. Here, at last, is a permanent non-clogging oil filter that protects oils longer, adds years to engine life, reduces friction and increases power! Revolutionary new filter element made of microscopic bronze balls formed under intense heat and pressure into a finer screen than can be woven from any metal or cloth. Amazing porosity of sintered bronze passes [illegible] and detergents, but filters out the tiniest particles of hard carbon, metal or water. Assures your engine of perfect, clear film of oil at all times. **CONVERSION KIT**—fits your present filter. (Specify filter make and model no.).... **$6.95**
CONVERSION KIT for cars with Ful Flow filter systems.................. **$13.95**
COMPLETE FILTER for engine not equipped with any filter.............. **$12.95**

52 pc. SOCKET SET



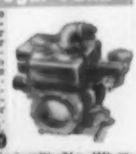
Highest quality, guaranteed non-breakable sockets made by Husky. Beautifully matched chrome thin wall alloy absolutely the best. Contains a complete set of 28 sockets in ½" drive, ⅜" drive and ¼" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all uncond. guaranteed against breakage. A beautiful set of tools that will handle any job; in a **big** doghouse steel box. Wt. 17 lbs. (Item 205) List price $62.90. Factory special.. **$27.95**

LESS THAN WHOLESALE

(Item 162)

HI-LINE 6000 WATT PLANT
Push Button Start 115-230 v. 60 cyc. A.C. A brute of a power plant with a rugged 14.6 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volts. Ideal where heavy current is needed. Wt. 590 lbs. Easily worth $995. **With crank start.** Factory price **$585.50**
Same plant, but **with self-starter**. $645.00
Generator and control box only, belt driven. Use your own engine or tractor. Wt. 240 lbs. (Item 163) Factory price **$345.00**

HI-FLO Centrifugal PUMP



Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. ! . . . Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Prelubricated sealed bearings for years of heavy low-cost service. **Big 1½" Model.** Item 502. Wt. 70 lbs. Factory price.... **$134.50**
2" Model (150 gal. per min.) with 2½ HP engine. Item 502a. 90 lbs. Fact. Spec. $154.50

BIG JOE Portable Pump

A powerful pump that handles up to 12,000 gal. per hour. Easy to operate. Self-priming (after initial prime), no foot valve needed—resulting in 25% more capacity. Exclusive impeller design provides maximum rate of water per horsepower, yet handles water containing a large percentage of stone, gravel and mud. 2 in. suction and discharge. Powered by an **easy starting 6 hp. Wisc. engine** and mounted on steel skids. Wt. 150 lbs. (Item 503). Factory price **$275.00**
Big rubber tired wheels, $20.00 additional.

JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 462. Special factory price.............. **$329.50**

EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable, 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **$8.95**

NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) wt. 6 lbs. **$6.95** 100 ft. (Item 200)........ $12.95

NO. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 502a) $10.45
50 ft. without fittings (Item 592)..... $9.45

Send check or M.O. Prices f.o.b. Factory. 10 day Money back guarantee. SEND 10c for ... *BIG 1955 Catalog*

MASTER MECHANIC MFG. CO., DEPT. SL Burlington, Wis.

WELD IT YOURSELF IN A JIFFY!

Weld, Cut, Braze, Solder; Iron, Steel, Brass, Bronze, Aluminum and other metals safely and easily. Make your wrought iron furniture, porch railings, fences, knick-knacks and other metal specialties. With this fine equipment anyone can do professional-like work with little practice. The Dynamic is an industrial type transformer arc welder designed to operate from any properly wired 110 volt AC line.

NOW as a FALL SPECIAL you will receive an $8.00 Twin Carbon Arc Torch FREE to complete your welding workshop. Order TODAY!

Literature on larger equipment available on request.

EASY PAY PLAN
Low down-payment. Pay as you weld. Money back guarantee. Complete outfit including special FALL GIFT.
***Only* $38.50**
F.O.B. Factory

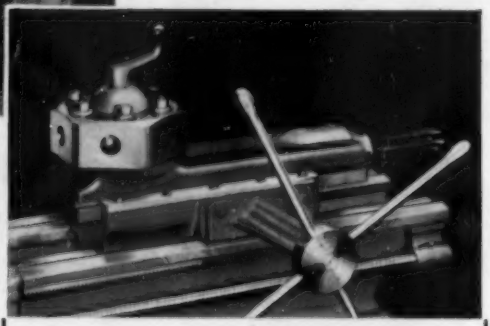
DYNAMIC WELDER COMPANY, 1808 S. Federal Street, Dept. D3-J, Chicago 16, Illinois

South Bend PRECISION TURRET LATHES

South Bend 2-H Precision Turret Lathe—1" collet capacity, 16¼" swing, 96 power turret feeds, 48 cross slide feeds, 48 carriage feeds, 48 thread cutting feeds.

Base Price $3190

South Bend Precision Turret Lathes keep efficient the machining of small duplicate parts. Their remarkable accuracy and positive controls simplify the holding of close tolerances with only normal machine handling care. Finishes are commonly produced that otherwise would require additional operations. Simplicity of tooling makes job changes quick and economical. Wide ranges of power feeds and thread cutting feeds assure maximum efficiency on every job. They are particularly suited for second operations. Available in 3 sizes: 1" collet—16" swing; 1" collet—10" swing; ½" collet—9" swing. Priced from $211. Time payment terms can be arranged. Only 3¼% annual interest on original unpaid balance.



TURRET ATTACHMENTS

South Bend Turret Attachments are available for tooling 9", 10", 13" and 16" swing South Bend Lathes for repetitive operations. Precision built for precision work, their rigidity and accuracy permit maximum feeds and speeds. Prices of hexagon bed turrets range from $273.00 to $698.00. Square Turret Tool Blocks are priced from $41.50 to $91.00. Write for Attachment Catalog giving full information on South Bend Turrets and the complete line of South Bend Attachments and Accessories.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941

Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

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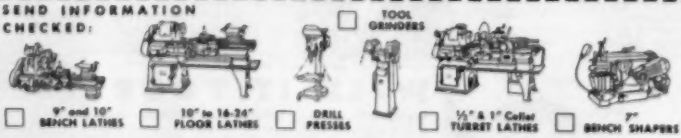

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ TOOL GRINDERS ☐ ½" & 1" Collet TURRET LATHES ☐ 7" BENCH SHAPERS

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Be a Success as a RADIO-TELEVISION Technician

See Inside

NRI Training Can Lead to Jobs Like These in Radio-Television

BROADCASTING: Chief Technician, Chief Operator, Power Monitor, Recording Operator, Remote Control Operator. SERVICING: Home and Auto Radios, P.A. Systems, Television Receivers, Electronic Controls, FM Radios. IN RADIO PLANTS: Design Assistant, Service Manager, Tester, Serviceman. SHIP AND HARBOR RADIO: Chief Operator, Radiotelephone Operator. GOVERNMENT RADIO: Operator in Army, Navy, Marine Corps, Forestry Service Dispatcher. AVIATION RADIO: Transmitter Technician, Receiver Technician.

Read What NRI Graduates Say

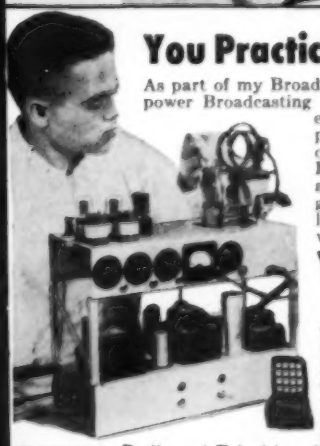
Owner of Appliance Store "I own a third of the Grantsville Appliance Co. in my home town with a branch in Spencer, W. Va. Things look very good for the future."—B. Siers, Grantsville, W. Va.

$10 to $15 Week Spare Time. "Four months after enrolling, was able to service radios—averaged $10 to $15 week spare time. Now have full time business." — Wm. Weyde, Brooklyn, N. Y.

Works on TV Color. "My position with WNBT is video control engineer. I owe a lot of my success to your textbooks."—Warren Deem, Malverne, N. Y.

Chief Technician. "Within a year I opened my own full-time radio shop. NRI training qualified me as Instructor during war. Now Chief Radio and TV Serviceman."—P. G. Brogan, Louisville, Ky.

Cut Out and Mail Postage-Free Card



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starting a few months after enrolling. All equipment
yours to keep. Mail postage-free card for Actual Lesson a

BUSINESS REPLY CARD

No Postage Stamp Necessary If Mailed In The United States

POSTAGE WILL BE PAID BY

NATIONAL RADIO INSTITUTE

16th and U Sts., N.W.

Washington 9, D. C.

FIRST CLASS

Permit No. 20-R

(Sec. 34.9, P.L.&R.)

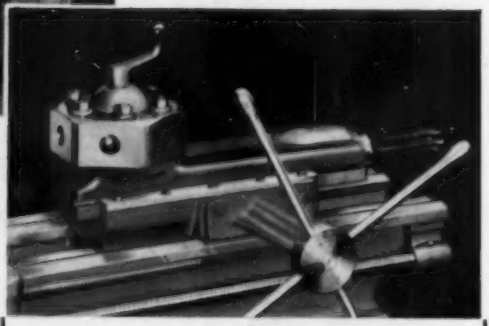
Washington, D.C.

South Bend PRECISION TURRET LATHES

South Bend 2-H Precision Turret Lathe—1" collet capacity, 16¼" swing, 96 power turret feeds, 48 cross slide feeds, 48 carriage feeds, 48 thread cutting feeds.

Base Price $3190

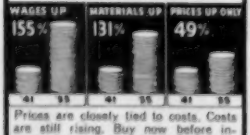
South Bend Precision Turret Lathes keep efficient the machining of small duplicate parts. Their remarkable accuracy and positive controls simplify the holding of close tolerances with only normal machine handling care. Finishes are commonly produced that otherwise would require additional operations. Simplicity of tooling makes job changes quick and economical. Wide ranges of power feeds and thread cutting feeds assure maximum efficiency on every job. They are particularly suited for second operations. Available in 3 sizes: 1" collet—16" swing; 1" collet—10" swing; ½" collet—9" swing. Priced from $211. Time payment terms can be arranged. Only 3¼% annual interest on original unpaid balance.



TURRET ATTACHMENTS

South Bend Turret Attachments are available for tooling 9", 10", 13" and 16" swing South Bend Lathes for repetitive operations. Precision built for precision work, their rigidity and accuracy permit maximum feeds and speeds. Prices of hexagon bed turrets range from $273.00 to $698.00. Square Turret Tool Blocks are priced from $41.50 to $91.00. Write for Attachment Catalog giving full information on South Bend Turrets and the complete line of South Bend Attachments and Accessories.

Compared with our costs
OUR PRICES ARE LOWER
than they were back in 1941



Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SEND INFORMATION CHECKED:

☐ 9" and 10" BENCH LATHES ☐ 10" to 16-24" FLOOR LATHES ☐ DRILL PRESSES ☐ TOOL GRINDERS ☐ ½" & 1" Collet TURRET LATHES ☐ 7" BENCH SHAPERS

Name _____ Street _____

City _____ State _____

Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

I'll Train You AT HOME in Spare Time for Good Jobs in RADIO-TELEVISION

America's Fast-Growing Industry Offers You

1. EXTRA MONEY IN SPARE TIME

Keep your job while training at home. Many NRI students make $10, $15 a week extra fixing neighbors' sets in spare time, starting soon after enrolling. The day you enroll I start sending you special booklets that show you how to fix sets. You use the Multitester built with equipment I furnish to locate and correct set troubles. Adam Kramlik, Jr., Sumneytown, Pa., wrote: "Earned $12 to $15 a week, spare time. Now have my own Radio-TV shop."

2. GOOD PAY JOB

Radio-Television growth and expansion and new uses for known principles are making more jobs for well-trained men. There are over 3000 Radio Broadcasting Stations on the air giving good pay to operators, technicians. Over 115 million home and auto Radios are now in use, providing full time and spare time servicing opportunities. Government, Aviation, Police, Ship, Micro-wave Relay, Two-way Radio Communications for buses, taxis, trucks, railroads are growing fields of opportunity.

3. BRIGHT FUTURE

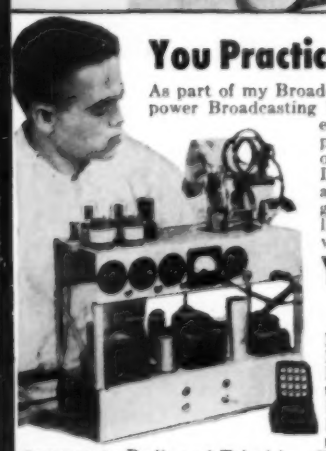
About 200 Television stations are now on the air from coast-to-coast. Hundreds more being built and hundreds of others authorized. These new stations will need operators, technicians. More than 25 million Television sets are already in use and require servicing. Thousands more Television sets are being sold every week and need installation, servicing. Act now to qualify for a good job or your own sales and service business. Cash in on this rapid growth.

Television is Making Good Jobs, Prosperity

Training plus opportunity is the PERFECT COMBINATION for job security, advancement. When times are good, the trained man makes the BETTER PAY, gets PROMOTED. When jobs are scarce, the trained man enjoys GREATER SECURITY. NRI training can help assure you and your family more of the better things of life. My training is practical, complete; is backed by 40 years of success training men at home. My well illustrated lessons give you basic principles you need and my skillfully developed kits of parts "bring to life" things you learn from the lessons.

You Practice Broadcasting *with Parts I Send*

As part of my Broadcasting Course I send you kits of parts to build the low-power Broadcasting Transmitter shown at left. You use it to get practical experience putting a station "on the air," performing procedures demanded of broadcasting station operators. An FCC Commercial Operator's License can be your ticket to a better job and a bright future. My Communications Course gives you the training you need to get your license. Mail card and see in my book other valuable equipment you build.



You Practice Servicing *with Parts I Send*

Nothing takes the place of PRACTICAL EXPERIENCE. That's why NRI training is based on LEARNING BY DOING. You use parts I furnish to build many circuits common to Radio and Television. With my Servicing Course you build the modern Radio shown at right. You build a Multitester which you use to help fix sets while training. Many students make $10, $15 a week extra fixing sets in spare time, starting a few months after enrolling. All equipment I send is yours to keep. Mail postage-free card for Actual Lesson and Book.

Find Out What Radio-Television Offer You

Without obligating you in any way, I'll send an Actual Lesson to prove that training at home is practical. I'll send my 64-page book to show good job opportunities for you in Radio-Television, show equipment you build, show what my graduates are doing and earning. Terms for NRI training are as low as $5 a month. Many graduates make more in two weeks than the total cost of my training. Mail coupon now. J. E. SMITH, President, National Radio Institute, Dept. 5JB, Washington 9, D. C. OUR 40TH YEAR.

The Tested Way to Better Pay

I TRAINED THESE MEN AT HOME FOR SUCCESS IN RADIO-TELEVISION

Now Has Own Shop. "Got laid off my machine shop job which was best thing that ever happened to me as I opened a full time Radio shop."—Ernest T. Slate, Corsicana, Texas.

Radar Job plus Spare-Time Earnings. "I have a job working on radar equipment. Also do spare-time radio and TV servicing. Have my own amateur radio station W3PRN."—F. Zawake, Scranton, Pa.

First Job Thru NRI. "My first job was operator with KDLR obtained for me by your Graduate Service Dept. Now charge of Radio Equipment for Police and Fire Dept."—T. S. Norton, Hamilton, Ohio.

Paid for Course Before Graduation. "By the time I graduated I had paid for my course, a car and testing equipment. Can service toughest jobs."—E. J. Streitenberger, New Boston, Ohio.

AVAILABLE TO VETERANS under G.I. BILLS

Want Your Own Business?

Many NRI trained men start their own business with capital earned in spare time. Let me show you how you can be your own boss. Joe Travers, a graduate of mine, in Asbury Park, N. J. writes: "I've come a long way in Radio and Television since graduating. Have my own business on Main Street."

CUT OUT ON DOTTED LINE

Mail this Card to Get 2 BOOKS FREE

ACTUAL LESSON

This card entitles you to actual lesson on Servicing. It will convince you that learning Radio-Television at home is easy, practical.

64 Pg. BOOK

MY DOUBLE OFFER also includes 64-page Book, "How to Be a Success in Radio-Television." You'll see what my graduates are doing, earning; see photos of equipment I send.

NO STAMP NECESSARY

MR. J. E. SMITH, President, Dept. 5JB.
National Radio Institute, Washington 9, D. C.

Mail me Sample Lesson and 64-page Book, "How to Be a Success in Radio-Television"—Both FREE. (No salesman will call. Please write plainly.)

NAME ..... AGE .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

VETS write in date of discharge .....

SEE OTHER SIDE

IT'S A PSYCHOLOGICAL FACT: **PLEASURE HELPS YOUR DISPOSITION**

How's your disposition today?

EVER FEEL TOUCHY AS A TIGRESS? It's only natural, when little annoyances irk you. But here's a psychological fact: pleasure helps your disposition. That's why everyday pleasures, like smoking for instance, are important. If you're a smoker, it's so sensible to choose your cigarette for utmost pleasure. What else but Camel!

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

Hollywood's BRIAN KEITH, sensational star of TV's dynamic new "Crusader", agrees that pleasure helps one's disposition. And Camels give *more pure pleasure* – more flavor, reliable mildness, smoke after smoke. Good reasons for *you* to try Camels. See why today their richer blend agrees with more smokers than any other brand!

No other cigarette is so rich-tasting, yet so mild!